

FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport.

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EDITORIAL COMMENT.

THE question of whether officers and men killed in the course of duty in this country should figure in the official casualty lists has been raised again in the case of an officer of the R.F.C. who was killed on Salisbury Plain while going through a "star" course. His name did not appear in the lists, and his father wrote to the War Office to enquire the reason of the omission. In reply he was told that "the names of officers killed in this country are not sent to the Press." Why?

A Roll of Honour Problem.

The officer in question, 2nd Lieut. Cox, had spent ten months at the front, and had taken part in several air-fights before he returned to England to undergo the course during which he met his death. That, apparently, all goes for nothing in the eyes of the hide-bound precedent-mongers of the War Office. The officer was killed in England—and that is all there is about it. It would not matter if he had served at the front since Mons, his name cannot appear in the Roll of Honour because he did not meet his death abroad! Lieut. Cox's father has put a hypothetical case to the War Office, and it will be interesting to see the reply, if there is any. Suppose,

says Mr. Cox, an R.F.C. cook, who has never been within the danger zone, is accidentally killed at his post. His squadron-commander, after undergoing air perils for two years, and winning the V.C., D.S.O., and M.C., is killed while instructing pilots in England. Which of the two is held worthy of the small recognition of a place in the Roll of Honour? Obviously, the answer according to the War Office manner of doing things is: the cook, and the cook only. We have no hesitation at all in describing the system as a disgraceful one, when it denies to the relatives of the fallen that small, but prideful, consolation of seeing the name of their dead inscribed on the Roll of Honour. These officers and men who are killed on duty at home are just as much on active service as those at the front, and to keep back their names in the way that is done is nothing but a piece of callous pedantry which is the result of too heavy a diet of precedent. It must be altered and the names of our dead who died at the post of duty must be given equality of treatment. What, we wonder, happens in the case of an officer or man who is killed by the enemy in the course of an air raid on this country, or during such a bombardment as that of the Kentish resorts the other night? We take it that, logically, their names are "not sent to the Press." They have been killed in England and are "Not Entitled." It is a queer institution, the War Office.

The Paper Crisis.

Everyone who has read Mr. Lloyd George's speech will have seen that again paper is one of the essential productions to be hit the hardest. Imports of paper and paper-making pulp, which had already been severely restricted, are to be still further reduced by no less than half. The resulting situation, from the point of view of the public and the proprietors of newspapers alike, is a most serious one. Many of the daily and weekly journals are endeavouring to meet it by raising their prices, in the hope that this will assist in keeping circulations down to the minimum. Others are limiting production, so as to keep their consumption of paper within the limits of the amounts for which they hold licences. So far as "FLIGHT" is concerned, for the moment we ask our readers once again to assist us by *ordering* their copies in advance from their newsagents.

In the ordinary course of the business of a newspaper there must be a certain percentage of "returns"—in other words, waste. By placing their orders for "FLIGHT" in advance much of this waste can

be avoided, because we shall be better able to gauge the exact requirements of our readers, to say nothing of the saving of annoyance to those who trust to be able to purchase their copies from the bookstalls and are disappointed. Nothing annoys the regular reader more than to be met with the formula: "Sold out." Our readers will save themselves that disappointment, and at the same time materially assist us and all who have to handle the Journal, if they will adopt our suggestion and order their "FLIGHT" now.

* * *

The Aeronautical Society's Activity.

The Aeronautical Society is making a notable departure, and one that deserves the highest commendation, in the inauguration of its series of educational lectures designed to assist in still further linking up science with industry. The syllabus of these lectures—given elsewhere—indicates that the subjects to be dealt with range through every conceivable branch of aeronautical knowledge, from history to meteorology and navigation, and it is difficult to see how it could be made more complete in a series necessarily limited in length. Not only are these lectures to be delivered at headquarters, but already it has been arranged that a centre is to be started at Hendon, which it is hoped will be the forerunner of many more such centres in different parts of the country.

We heartily congratulate the Society on this fresh evidence of its interest in the industrial development of aircraft. Only by the close co-operation of the scientific and industrial branches can we attain to, and keep, the lead in aircraft design and construction. There is no need to again labour the point that it is vital to our existence as an Empire that we should hold that lead. We know that it has become an article of faith among our readers that air supremacy means as much in the future as sea supremacy means to-day, and they, with us, will welcome that closer co-ordination of science and production which is foreshadowed by this educational campaign of the Society

* * *

To India by Aeroplane.

Lord Montagu, in his lecture at Delhi, in January, upon the telegraphic summary of which we commented at the time, appears to have been in optimistic vein regarding the future of aerial transport. He predicted that in ten years' time all the mails would be carried by aeroplane between England and India, and that aerial passenger services would also have been established. He told his audience that passengers from Delhi would be able to land in London on the third evening after leaving! As he pointed out, the distance from Bombay to London is only 3,600 miles as the aeroplane flies, so that in the case of a passenger service, allowing a rest of 14 hours out of the 24, and travelling only 10 hours at 120 miles an hour, 1,200 miles would be covered each day. The passenger from India would sleep the first night at Gurieff, at the head of the Caspian, and on the second at Tarnopol, in Galicia, arriving in London on the third day. The mails would be conveyed by aeroplanes making a continuous flight by night and day, the landing places being illuminated, and the route indicated by miniature lighthouses. Thus the time occupied would be reduced to 36 hours.

As for passengers, said Lord Montagu, the big

Russian Sikorsky machine, with four engines, had already achieved 80 miles an hour with 16 passengers. If ten aeroplanes a day started they could carry 140 passengers, with a pilot and assistant pilot, or about 1,000 passengers per week, which was a greater number than now left Indian ports. As to cost, he felt sure that after the first year or two the fares for passengers would be considerably less than those at present charged by the mail steamers, and he hazarded the conjecture that at first about £40 for the single journey and £70 for the return trip would be charged. India, he said, would be a stage on the route to the Far East and Australia. The mail route to Australia would go on from Peshawar by Calcutta, Rangoon, Singapore, and by seaplane by British North Borneo to Queensland, whence the Australian mail services would take up the distribution.

It is an alluring prospect, and one that to the lay mind may possibly approach the fanciful. A decade ago Lord Montagu would have been generally voted mad, but—and that is the wonderful thing about the progress of aviation—to-day he would be a bold man who would venture to challenge his predictions. With all the knowledge we possess of the limitations as well as the possibilities of the aeroplane, we should certainly hesitate to say that these prophecies are not likely to be justified down to the last letter. Neither mechanically nor commercially do we see the slightest reason for thinking that there is anything impossible or fanciful in the picture Lord Montagu has drawn for us. On the contrary, there is every reason to think that on both issues the thing will be found practicable and payable. When we regard the progress that has been made in the past ten years, and attempt to visualise that which must be achieved in the next decade, we are almost inclined to think for the moment that if Lord Montagu erred at all it was on the side of caution. But it is a good thing never to prophecy unless one is sure, and in his forecast of the future he kept within the bounds of what he felt he knew. That is really what it amounts to—and it is all very wonderful to contemplate.

* * *

The Peril of Optimism.

Lord Selborne, presiding the other day at the meeting of a company of which he is chairman, made a speech which ought to be read and pondered by every thinking citizen of this country. He prefaced his remarks by saying that he saw no signs at all in favour of an early peace, and then went on to say:—

"You see in the German Reichstag that the speakers are still talking about extracting an indemnity out of the Allies. To us that appears quite childish, but I do not think it is mere bluff on their part. I think it indicates the sense of the speakers that their country has still great resources—not only material resources, but great resources in national spirit, and they do not feel themselves at all at the end of their powers or of their opportunities and means of defence.

"We can make no greater mistake, in my judgment, than that of underrating the power of our foes in this war, and therefore I think that all sensible and patriotic women and men ought to prepare themselves for a prolonged state of war and support the Government in all measures of precaution and prescience which are taken, and to say as little about it as they can."

There is very little in the way of comment that can be made on these pregnant words. They are well timed, coming as they do at a period when the three years time limit of the war is approaching its end. Lord Kitchener told us in the beginning that it would take us that length of time to achieve victory, and it has almost become an article of faith with many that



Supermarine versus Submarine.

Britannia "Speering" the slippery U. pirates.

the war cannot continue after next August, because by that time the Hun will have been defeated as much by the failure of his own resources as by the relentless pressure of the military power of the Allies. We may still be permitted to indulge the hope that things may in fact turn out this way, but we agree wholeheartedly with Lord Selborne that the present indications do not justify even the hope, let alone the belief. Rather do they point to still greater effort and still deeper sacrifice on the part of the peoples who have allied themselves in the task of hunting down and destroying the wild beast of Prussian militarism. That noxious animal is a long way from being dead—he is as full of life as ever—and we have a long and bitter struggle to go through before we shall have the satisfaction of seeing him in his death agony. The unforeseen and unexpected *may* happen, but the opportunism, the fatuous optimism, that would have us slacken a single effort in the hope of the unexpected turning up is closely akin to criminal madness.

The Air Services in Parliament. Speaking in the House of Commons last week, Mr. Forster, Financial Secretary to the War Office, referred at some length to the Air Services. His remarks are well worth studying, both for their general interest and for the light they throw upon the difficulties which have had to be contended with in bringing those services to the undoubtedly high state of efficiency to which they have attained. His statement will be found in our usual report of Parliamentary procedure, and in this the very well-deserved tribute to the gallantry of the officers and men of the flying services will be welcomed by all who have followed the magnificent work they have done in every theatre of the war. Where all have behaved with the most self-sacrificing devotion it seems almost invidious to single out any one branch of the Services for special commendation, but if there is one arm of the

fighting forces of the Crown that has deserved such special differentiation as that implied, it is surely the flying branch.

We also welcome the admission that there has been difficulty in obtaining a sufficient number of aircraft to keep our squadrons at the various fronts up to the requisite strength. There is nothing for anyone to feel particularly pleased about in the admission that we have been found wanting, but we are sufficiently familiar with official ways to know that when a responsible Minister spontaneously confesses that there have been difficulties and delays which have now been overcome, it argues that they are really a thing of the past. This unrequested admission is a totally different thing to the halting confession extorted under pressure from a Minister whose only aim is to suppress the facts of a case. We may therefore take leave to hope that in the future there will be neither delay nor difficulty in obtaining all the aircraft we need to retain that mastery of the air that we believe we hold for the present. If we are now in the happy position of being able to get all we need, it is up to the Government and the Air Board to see that matters do not stand still. Having arrived at the point for which we have been aiming ever since the outbreak of war, it will not do to mark time. Production must still further be speeded up, and design must not be allowed to stagnate. The last is the chief danger to be apprehended where quantity is one of the governing considerations, and it is a very grave danger indeed because it is so obviously the line of least resistance. However, we may have every confidence that the new Air Board will be found to be very much alive to this, and that they will see to it that production and progress in design go forward hand in hand. Altogether, the right hon. gentleman's utterances constitute about the most reassuring statement regarding the immediate future of the air services we have heard since the beginning of the war.

THE ROLL OF HONOUR.

Reported by the Admiralty:—

Killed.

Flight Sub-Lieut. J. E. Northrop, R.N.
Flight Lieut. E. L. Pulling, D.S.O., R.N.

Accidentally Killed.

Flight Sub-Lieut. G. R. G. Daglish, R.N.

Missing.

Flight Sub-Lieut. G. T. Bysshe, R.N.
Flight Sub-Lieut. L. E. Smith, R.N.
F. 7815 2nd Grade Air Mechanic R. S. Portsmouth.

Wounded.

Actg. Flight-Com. C. C. R. Edwards, R.N.
Flight Sub-Lieut. Leslie A. Powell, R.N.

Seriously Injured.

Flight Sub-Lieut. A. F. Marlowe, R.N.

Slightly Injured.

Prob. Flight Sub-Lieut. G. F. Creaghan, R.N.
Flight Sub-Lieut. S. F. Ingram, R.N.

Previously reported Missing, now reported to be Prisoners of War.

Flight-Lieut. J. C. Croft, R.N.
Lieut. S. R. Hibbard, R.N.V.R.
Flight-Lieut. H. C. Vereker, R.N.

Reported by the War Office:—

Killed.

Lieut. J. G. B. Baines, R. Warwicks, attd. R.F.C.
2nd Lieut. A. Ball, K.O. (R. Lancs.), attd. R.F.C.

Died of Wounds.

2nd Lieut. R. L. M. Jack, Gordon Hdrs. and R.F.C.

Accidentally Killed.

3363 Sergt. J. V. Barnard, R.F.C.

Previously reported Missing, now reported Killed.

14454 Corpl. R. D. Fleming, R.F.C.
191 Flight-Sergt. W. G. Webb.

Wounded.

Lieut. H. E. Bagot, R.F.C.
2nd Lieut. L. L. Brown, R.F.C.
2nd Lieut. L. L. Carter, R.F.C.
Lieut. J. F. Ferguson, Can. Pioneers, attd. R.F.C.
Lieut. R. Lund, R. Berks, attd. R.F.C.
2nd Lieut. A. M. Morgan, R.E., attd. R.F.C.

Missing.

2nd Lieut. J. Fairbairn, R.F.C.
2nd Lieut. E. W. Lindley, Manchester and R.F.C.

Missing, believed Prisoner of War in Bulgarian hands.

Lieut. J. C. F. Owen, Can. A.S.C., attd. R.F.C.

Flax for Aircraft Work.

AN order has been made by the Army Council requiring all persons engaged in the purchase or sale of raw flax to furnish such particulars of their business as may be required by or on behalf of the Director of Aircraft Equipment at any time. It is further announced with reference to the Army

Council order dated December 30th, 1916, in which the price was fixed based upon the price ruling during the fortnight ending December 16th, 1916, that the price of the best grade of fine Irish flax will be taken at 27s. 6d. per stone, with proportionate variations for the lower grades. All communications should be sent to D.A.E.4.S.3, Air Board Office, Strand, W.C.

METAL IN AEROPLANE CONSTRUCTION.

(Concluded from page 177.)

In Fig. 1, *a* and *b*, are shown side elevation and plan of a body of the proportions assumed for the wire braced body. For the struts we have chosen a uniform length of 2 ft. 6 ins., the uniform length being advantageous from the manufacturing point of view. By suitably crossing and recrossing the struts, the "free length" of *longeron* between struts can be fairly well proportioned in accordance with the load at any point. We have not taken into account the opening in the top of the body where occurs the pilot's seat, as the slightly different arrangement of the transverse struts in this place will have no appreciable influence on the weight calculation. For purposes of calculation a channel section form of strut has been chosen, the proportions of which are shown in *d*, Fig. 1. One reason for choosing a strut of this shape is that,

but which does have the advantage of being easily produced as a stamping, the area is about 28 sq. ins. An 18-gauge strut would probably be sufficiently strong, bearing in mind the fact that the *longeron* is 16 gauge. We have then:

Area of one strut = about 28 sq. ins.

Thickness (assumed) = 18 gauge = .048 in.

Cubic contents of one strut = $28 \times 0.048 = 1.34$ cu. ins.

Cubic contents of 76 struts = $76 \times 1.34 = 101.84$, say, 102 cu. ins.

Weight of 1 cu. in. of aluminium alloy = 0.1 lb.

Weight of 102 cu. ins. = $102 \times 0.1 = 10.2$ lbs.

Assuming a weight of 2 lbs. for the necessary rivets, we have a total weight of $9 + 10.2 + 2 = 21.2$ lbs.

Compared with a weight of 41 lbs. for the wire braced

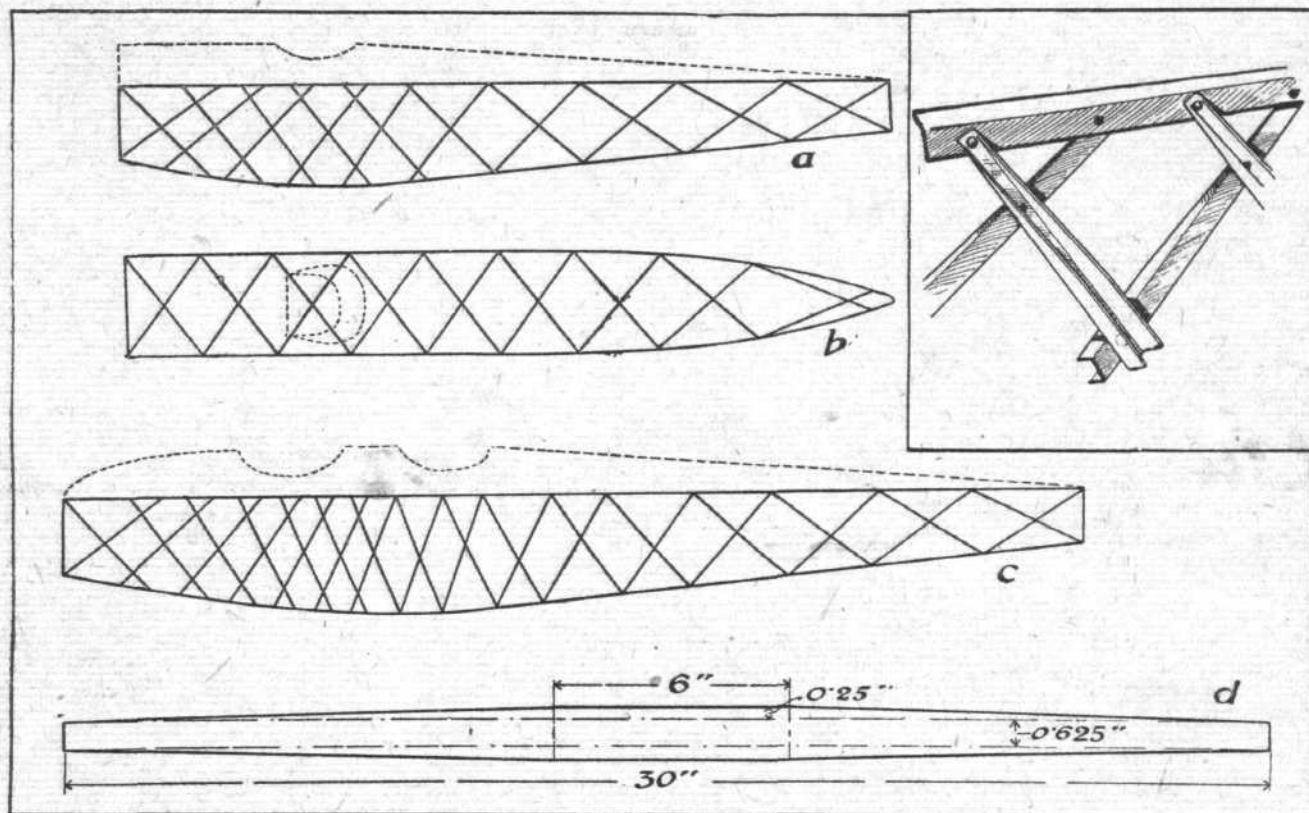


Fig. 1.—*a* and *b* are diagrammatic side elevation and plan respectively of the suggested form of metal construction for a single-seater body. In *c* is shown the application of the same size struts to the body of a two-seater. The proportions suggested for the struts are indicated in the diagram *d*, while the inset is a sketch of the finished construction.

except where the *longerons* are parallel, the point where the struts cross each other will not lie in the centre of the strut, and that therefore the majority of the struts will have to be riveted at some point not in their centre.

With the proportions of the various parts calculated or assumed, the weight of the aluminium alloy body can be estimated.

Length of *longerons* 15.5 ft.

Area of section 0.12 sq. in.

Cubic contents of one *longeron* = $15.5 \times 12 \times 0.12 = 22.32$ cu. ins.

Cubic contents of four *longerons* = $22.32 \times 4 = 89.28$ cu. ins.

Weight of aluminium alloy = 0.1 lb./cu. in.

Weight of four *longerons* = 8.928 lbs., say 9 lbs.

With the type of strut shown, which we do not, of course, necessarily claim to be the best possible form,

body, this figure looks very promising, being only slightly over half the weight. Even if it be found in practice that a certain amount of reinforcement is advisable in places, as for instance at the points where wings and chassis struts are attached, and possibly at the rear to take shearing stresses, there is a large margin before the weight of the wood girder body is reached. It, therefore, appears reasonable to suppose that it is possible to construct an aeroplane body of metal, which for the same strength works out at certainly not a greater weight and in all probability will be found to come out a good deal lighter, while at the same time possessing undoubted advantages from the point of view of rapid production. In order to illustrate the possibility of employing the same stamping in machines of different sizes we have sketched a two-seater body of considerably larger dimensions in *c* Fig. 1. We do not, of course, mean

to say that in so doing the maximum efficiency is reached, but where a manufacturer is turning out different types of machines it means that he can use the same stamping for the body struts of small single seaters as well as for larger two-seaters, thus saving the cost of extra dies. Owing to the fact that one strut of each X is on the outside of the *longeron* it would probably be found necessary, in order to avoid bulging of the fabric, to run a stringer or two along each side.

Having decided in the previous considerations that there is probably a gain in weight for a given strength attending the employment of aluminium alloy, and certainly a very considerable increase in production, the next obvious step will be to examine whether or not equally good results may be expected from a substitution of alloy for wood in the construction of the wings. As regards the ribs, although a saving in weight might conceivably be effected, wing sections

from present practice, but be such as to allow of its gradual adoption.

The objection to stamping out ribs, that of difference in size, applies also to the spars to a certain extent, since at any rate the depth of a spar is usually as great as the section employed will allow. A simple channel section spar will, therefore, hardly come into general use until standardisation has reached such a stage that the stamped rib becomes a commercial proposition. In the case of the spar, however, girder construction might probably be employed, and although the work entailed in making a built-up spar would, perhaps, be as great as that of spindling an I-section spar out of wood, an advantage over wood construction would be that the difficulty of obtaining silver spruce of sufficiently great lengths for a very large machine would be overcome. In the case of a small or medium size machine, as, for instance, a single seater scout or a two-seater machine

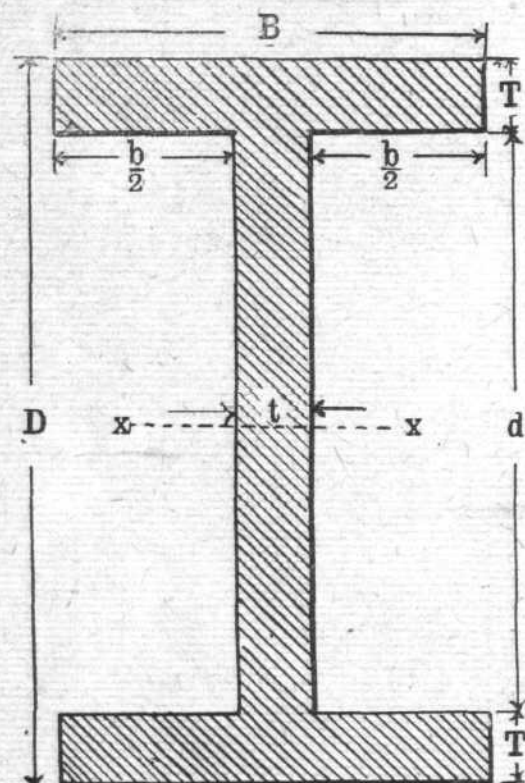


Fig. 2.

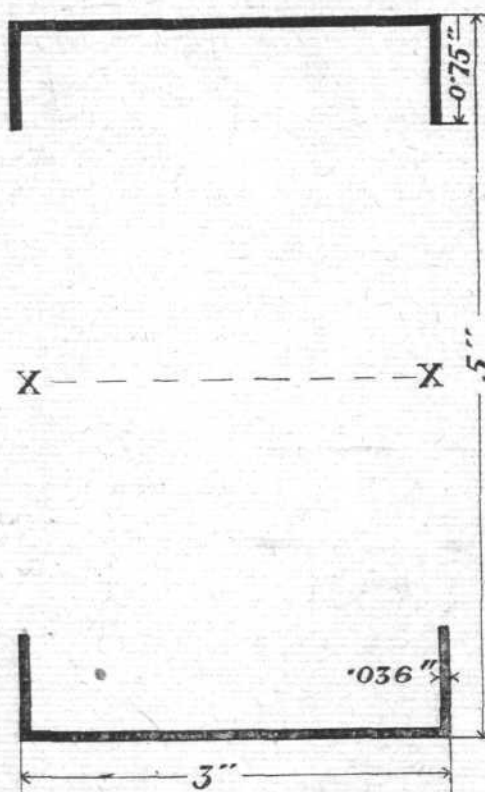


Fig. 3.

Fig. 2.—Section of a spruce spar of the following dimensions: $D = 5''$, $B = 3''$, $t = \frac{1}{8}''$, and $T = \frac{1}{4}''$.

Fig. 3.—Diagram of the two flanges of an aluminium alloy spar, so proportioned as to have approximately the same moment of resistance as the spruce spar shown in Fig. 2.

have not, we think, yet reached a degree of standardisation which will allow of going to the expense of making dies for ribs, a method that would appear otherwise to be the most economical solution of the problem of rapid and cheap production of this component part. Not only do wing sections vary considerably as regards shape, but even a given shape will vary greatly in size according to the machine on which it is to be employed. A built-up rib might possess as good a weight/strength ratio, or even a better one, than a wood rib, but the cost of manufacture would then in all probability be as great as in the case of the old form of construction. At present there would not, therefore, appear to be a great deal to be gained by constructing the ribs of a wing of metal. That the time will come when the whole wing, including the covering, will be made of metal, is quite conceivable, but with this we are not at present concerned. What we are concerned with, however, is the finding of a method whereby present forms of construction may be improved, and a method, moreover, which shall not entail too radical changes

with an engine power of up to 200 h.p., any saving in weight that might attend the employment of metal construction would probably not be great enough to justify the change, but for larger machines, the problem might be worth considering. Obviously the larger the machine the greater the advantages to be gained by the metal construction.

Without going into detailed calculations of the strength of such unsymmetrical sections as a wing spar, it is possible, by some simple calculations for symmetrical sections, to form an opinion of the relative merits—from the point of view of weight/strength ratio—of the built-up metal spar and the I-section wood spar. By way of an example, we shall take an I-section spar of silver spruce, in which the depth is 5 ins., the width 3 ins., and the thickness of web and flanges $\frac{1}{8}$ in. If the notation shown in Fig. 2 is employed, the moment of inertia with reference to the neutral axis xx is:—

$$I_{xx} = \frac{1}{12} (BD^3 - bd^3) = \frac{1}{12} (3 \times 5^3 - 2.5 \times 4^3) = 17.9.$$

The moment of resistance of a spar of these dimensions and made of spruce will then be

$M = f_c \frac{I}{y_c} = 8,500 \frac{17.9}{2.5} = 60,860 \text{ lbs. ins.}$, the compressive breaking strength of silver spruce being taken as 8,500 lbs. per sq. in. The weight of such a spar, taking the weight of silver spruce as .018 lb./cu. in. will be 1.08 lbs. per foot run, disregarding the fact that the spar would probably be left solid at the points where the interplane struts were attached.

There next remains to determine the proportions of an aluminium alloy spar to have the same strength, and to see how its weight compares with that of the spruce spar. In the first place, we shall take it that the metal spar will have to be of the same overall dimensions as the wood spar, *i.e.*, 5 ins. \times 3 ins. For the flanges a channel section will be chosen, while the web will take the form of lattices. In Fig. 3 are shown the dimensions of the metal spar section. The corners are shown sharp, whereas in reality the section would probably be rolled and have slightly rounded corners, but this fact is not thought to have any practical value in the argument. If the metal from which the section is rolled is 24 wire gauge—.036 in.—the other dimensions being 3 ins. and .75 in. respectively, the moment of inertia of the section will approximate to: (area of two flanges) $\times \left(\frac{d}{2}\right)^2$, where d is the depth of the section, or

$.316 \times 2.5^2 = 1.98$; taking the breaking strength of aluminium alloy as 78,400 lbs. per sq. in., the moment of resistance M of the section will be:

$$M = f \frac{I}{y} = 78,400 \frac{1.98}{2.5} = 62,092.8 \text{ lbs. ins., which is}$$

a little higher than the moment found for the spruce spar.

It has already been mentioned that the web of the spar will be in the form of a lattice girder. As regards the shape of the component parts of this lattice girder, there is a sufficiently great scope for variety. Some designers will probably advocate one form, others another. In the latest Zeppelins the formation of the aluminium lattices is in the form of a series of X's, whereas in the older types the N and W formations were employed. If, after something like 16 years of experimenting with lattice girders of this material the Germans have decided, in their latest airships, in favour of the X formation, there would appear to be reason to believe that, taking everything into consideration, this formation is the most satisfactory of the, no doubt, considerable number experimented with. It does not, of course, necessarily follow that because this has been found so in the case of an airship, the same will apply to the aeroplane spar, but since we are here not endeavouring to furnish detail working drawings but merely to point a way, as it were, the Zeppelin X will be taken as a basis. In Fig. 4 are shown the shapes and approximate dimensions of a Zeppelin girder. Each of the lattices is stamped out, and two lattice bars turned back to back are riveted together and to the corner rails of the triangular section girder. Four rivets, it will be seen, secure the centres of crossing lattice bars to one another, while each bar is secured to the corner rail by two rivets. In our opinion, a single rivet in the end of a bar and a single one where the bars cross would have been better as a closer approximation to a pin joint against vibration, but there is the fact, the Germans are using more.

For the purpose of the argument, it may be taken that the lattice bars are of the Zeppelin type, and we shall keep the angles between the bars the same, *i.e.* 80 and 100 degrees respectively. This will give a lattice bar, for a section 5 ins. deep, of approximately 8 ins. length. Taking the width (total width) as 1 in. and the thickness as 24 gauge (.022 in.) the cubic contents of one lattice bar will be .176 cubic in. Taking the weight of aluminium alloy as being 0.1 lb./cubic in. the weight of each lattice bar will be $.176 \times .1 = .0176$ lb. If we assume an average spacing of the lattices of 6 per foot run, the weight of the lattices per foot run will be $6 \times .0176 = .1056$ lb. The weight per foot run of the flanges will be 0.3792 lb., and the total weight per foot run of the complete spar will then be $0.3792 + 0.1056 = 0.4848$ say 0.5 lb. Compared with a weight per foot run

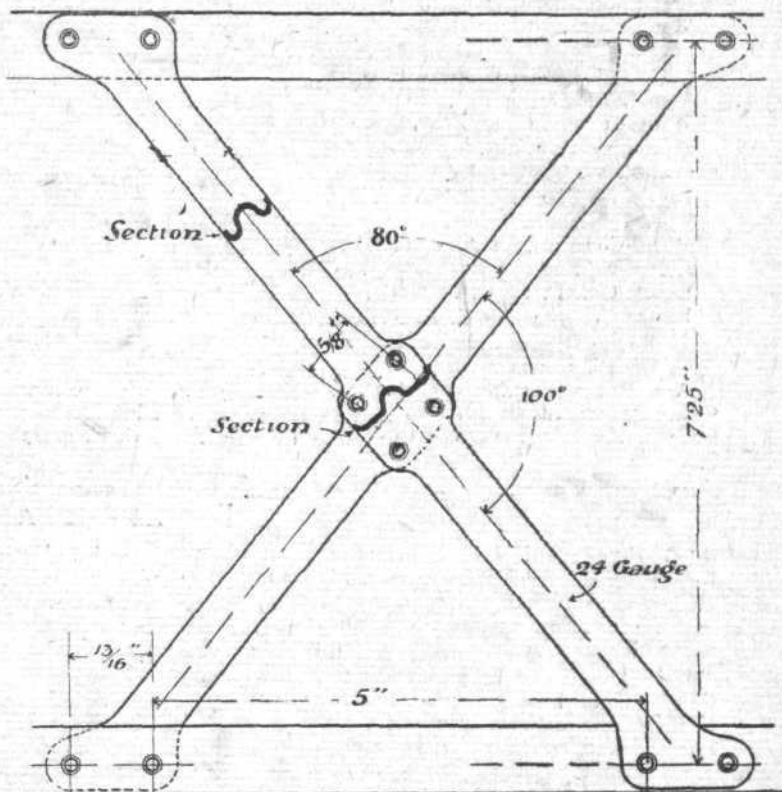


Fig. 4.—Diagram giving the approximate proportion of the lattice bars in a Zeppelin girder.

of the spruce spar of 1.08 lbs. there would, therefore, appear to be a very considerable saving in weight attending the employment of aluminium alloy.

That very great advantages may attend its employment we are convinced, and even if it be found impracticable to at present launch out upon metal construction on a large scale, the time has, we think, come when experiments should be conducted along the lines indicated, not only by the authorities but also by the private constructor. While aluminium alloy has been suggested, we do not necessarily mean that other materials, such as steel, will not offer a possible solution, and much of what has been said in the foregoing would apply equally well to steel.

In the first part of this article, which appeared in the February 22nd issue of "FLIGHT," a printer's error unfortunately crept into the formula for the crippling load of a strut. In the denominator of the fraction, 1 should be substituted for the first I , the correct formula being:—

$$P = \frac{f_c \times A}{1 + \frac{f_c \times l^2}{\pi^2 \times E \times k^2}}$$

Answers to Correspondents.

[As a number of letters reach us signed with initials only, some of which do not give a complete address, we would point out that such communications cannot be dealt with in our columns. Full name and address, which will not be published, must always be given.—Ed.]

A. R. (Norbury); B. F. S. (Bristol).

The subject of proper heat treatment of Duralumin, which is of general interest, is dealt with in a paragraph on page 238.

H. F. V. B. (Holt).

For speeds such as are attained in present-day aeroplanes the centre of pressure is not generally supposed to shift for any given angle of incidence. What you apparently have in mind is the travel of the centre of pressure with changes in the angle of incidence. The amount of this travel varies in different sections, but that shown in our "Answers to Correspondents" column in last week's issue of "FLIGHT" may be taken as being fairly typical for a modern section. The travel of the centre of pressure here ranges from about 0.32 of the chord from the leading edge at about 12° incidence to 0.57 of the chord at 0° incidence. Where a single inter-plane strut is fitted this should obviously be so placed that the moments around its point of attachment are the same whether the c.p. is in front of the strut or behind it, i.e., half-way between the two extreme positions of the c.p., in this case at about 0.45 of the chord from the leading edge. With regard to the efficiency of the spur gear you refer to, there is no reason to suppose that this would be less for the larger spur wheels; on the contrary, the larger the wheels, within reason, of course, the greater the number of teeth that can be given them, which always makes for greater efficiency.

H. E. B. (Walthamstow).

In machines with twin propellers it is usual practice to have the two propellers running in opposite directions in order to equalise the torque. This was, for instance, the case in the twin-engined Caudron biplane, where one of the Anzani engines was altered to run in the opposite direction to that usual in these engines. Machines have, however, been built and successfully flown, in which both propellers ran in the same direction, and we have not heard of any difficulty arising from that source.

A. W. D. (Fareham).

In the majority of modern aeroplanes the *ailerons* are so interconnected that when one moves down the other moves up. It is not, however, invariably the case, some machines, as for instance certain of the Short seaplanes, still being fitted with the older type single acting *ailerons*. It is generally thought that the tendency of a machine to yaw when the *ailerons* are single acting is somewhat lessened by inter-connecting them, but pilots appear to differ in their opinions on this point. The chief advantage of *aileron* control over warp control, apart from the fact that warping a wing will weaken it in time, lies in the fact that the former is more positive in its action at high angles of incidence. This is due to the fact that warping a wing simply means increasing its angle of incidence towards the tip, and if the wing is already flying at or near its angle of maximum lift a further increase in the angle of incidence means more resistance but *not* more lift. With the *aileron* however, a virtual increase in the camber is obtained, which may give more resistance, but which will certainly give more lift.

E. H. S. (Hull).

If you are physically fit the fact that you have had on flying experience does not bar you from applying for a commission in the R.N.A.S. If accepted you would be trained at a Government school. The pay of a Probationary Flight Officer is 10s. per day plus 4s. per day flying pay. On graduating you would receive a further 4s. a day flying pay.

D. H. L. (Woodford Green).

Your application will probably be put back until you are 18.

A. H. (Blandford).

For enlistment in the R.N.A.S. you should apply to any Naval recruiting office or to the Drafting Office of the R.N.A.S. at the Crystal Palace. You can enter as a skilled mechanic if you pass the standards, whatever your Army classification. Unskilled men are only taken if they are B1, B2 or C1.

R. H. T. (Seaton Carew) and many others.

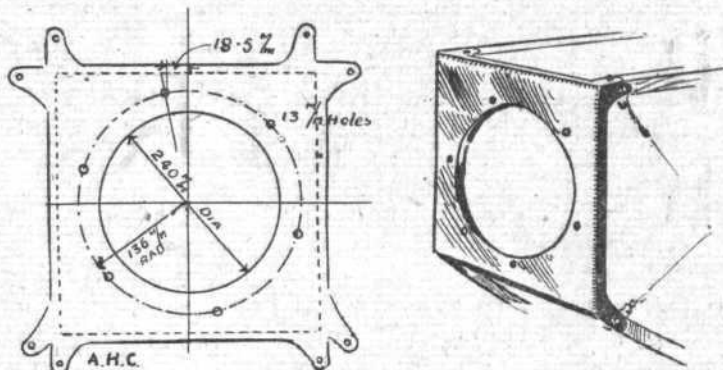
The minimum age is 18. For particulars of the R.F.C. Cadets apply to the Directorate of Military Aeronautics, War Office, London, S.W.

B. H. W. (Shrewsbury).

When you are 18 send in an application, on a form which you can obtain from the Admiralty, to the Director of Air Services. You should get a copy of "Hints for Flight Sub-Lieutenants," which can be obtained from "FLIGHT" offices for 1s. 2d., post free.

A. H. C. (Golders Green).

The thrust obtainable with a 45 h.p. Anzani engine will, of course, vary according to the efficiency of the propeller used. As a fair average figure, which may reasonably be expected, we should think you might count on a thrust of about 200 lbs. The Anzani engines are designed to be mounted on a single capping plate by means of six bolts



passing through the crank case. The spacing of these bolts is shown in the accompanying diagram, as is also the diameter of the circular hole cut in the engine plate through which is passed such accessories as magneto, oil pump, &c. An illustrated description of various mountings and cowlings of Anzani engines appeared in our "Constructional Details" series in our issue of September 14th, 1916. The outside diameter of the engine plate will depend on the shape of the nose of the body, but it should be kept as small as possible, both in order to save weight and also to reduce vibration. For the 45 h.p. Anzani engine the engine plate is usually made of 10 Standard Wire Gauge mild steel.

W. S. (Lennoxton) and numerous other correspondents.

Apply to the Secretary of the Admiralty for the conditions under which temporary commissions are granted in the R.N.A.S.

G. B. P. (Huntingdon).

1. You would probably have to pass through the Cadet Corps. 2. R.F.C. uniform without rank badges and with white band round cap. 3. It is unlikely that he would obtain commission as pilot, but might be accepted as an Equipment Officer if qualified.

L. H. (Wigan).

1. 12s. 6d. a day. 2. Apply to the Directorate of Military Aeronautics, War Office, S.W.

L. J. P. (Sleaford).

You cannot do better than get Burls' "Aero Engines," which can be obtained from "FLIGHT" Office for 9s. 6d. post free.

J. T. (Highgate).

Apply to any firms advertising in "FLIGHT," asking if they have any vacancies. They would also give you particulars regarding premiums and length of apprenticeship.

G. E. G. M. (Edinburgh).

We should recommend "Aircraft of To-day," which can be obtained from "FLIGHT" Office for 5s. 6d. post free.

L. H. C. (Wanstead).

You would probably be able to join if there are vacancies. For the R.N.A.S. apply to the R.N.A.S. drafting office, Crystal Palace, S.E., and for the R.F.C. to the Polytechnic, Regent Street, W.

W. H. (Manchester).

(a) You may apply for admission to the R.F.C. Cadet Corps. (b) The pay is the same as a private. (c) Apply to the Director of Air Services, Admiralty, S.W.

J. W. S. (Barnsley).

You would only be able to enter either if you can pass the trade tests; see reply to L. H. C. above.

ARMCHAIR REFLECTIONS

by the "Dreamer"

REFRESHING, indeed, is any book that comes to hand wherein the author has clearly and simply recorded happenings in a spontaneous vein of thought. Such a book is the latest addition to the aviatric library, *War Flying*, by "A Pilot." It is so delightfully and simply expressed, so pleasing in its "boyishness," that one feels instinctively the rushing of the wind past the wires and struts; the buffets on the face with which it greets the disturber of its way.

Possibly the fact that the text is made up of letters written from the Front to the author's mother and published in book form accounts in some measure for its breeziness. Possibly, had the writer known that he was writing for publication, he would have fallen, as so many others have fallen, and attempted style. Possibly had he done so he would have spoiled the whole effort. The fact remains that he did nothing of the sort, and the result is a book that makes one hope this will not be a last effort.

Let me take a few extracts from this book that breathes youth and boyish spirits, and British pluck. And let us remember that "Theta" is not yet 20 years old.

This in the period of his training :—

"It is cold and misty, and when not misty it is windy, when it is neither it rains and so on, but mist from the marshes is the worst by far. So sometimes we sits and thinks and cusses and smokes; and sometimes we just sits."

These from his private log-book :—

"Stalled machine all round aerodrome. Wind screen completely frosted over; had to take machine to 1,000 ft., lean out and clean screen. Same day got in hot air over factory chimneys. Hell!"

A few weeks later :—

"Second solo on new type. Side-slipped through turning without flying speed. Ghastly sensation."

But it is in the letters when on active service that we get the best atmosphere :—

"Dunno why the other squadron was mentioned in despatches. They have about seven of our chaps there—perhaps that's why—or perhaps the General lost some money at bridge to the C.O., or perhaps they drew lots for it."

Again :—

"One could hear the bang of our big guns when they fired salvos under us, and at times we got bumps from the shells passing near us in the air. . . . I don't know how near the shells pass. . . . They were not being shot at us."

Nerves seem to be unknown to this "Eaglet," for on being sent out to take some photographs he afterwards indulges in looping for the first time. Just to see what it was like :—

"I tried a dozen or so shots at it,"—the farmhouse he was sent to photograph—"and then, as I had reached a height of 6,000 ft., I thought I would try to do my first loop."

"I shoved the nose down, 70-80-90-100 m.p.h. The Pitot tube did not register any higher; the liquid went out at the top, . . . pulled the joy-stick back into my

tummy, and up went the nose. . . . Gee, how slowly she seems to be going. Ah, she's over at last. Cheer-o. Now I'll write home and tell them. No, I *must* do another. If I did only one they would think I had funk'd it after the first shot.

Down goes the nose again, then up-up, and slower-slower. By Jove, she's going to stick at the top of the loop this time. . . . I grip the joystick fiercely with both hands. Ah, she's over. Now I'll get off to the aerodrome and show them how to do it."

As a matter of fact he did two more over the aerodrome, and then spiralled down. Not so bad for a first attempt.

The author's own opinion is :—

"I am quite bucked, though, at having done it, and it was a curious sensation, to say the least. I have been warmly congratulated; they were d—d good loops."

Isn't this every bit a boy's doings?

"As I was going out of the aerodrome I flew over a passing car and we waved merrily to each other. Then I chased the car, slowed my engine and dived at it, and a little later flew at it again. The driver must have been watching me too closely, for he went into the ditch. My passenger was awfully bucked about it."

I could go on in this way until I had told you the whole book, so good is it, but will finish with the following :—

"Well, I have little news for you this time. To let you down lightly, I will first tell you that I am having several new walking-sticks made, and with your usual Sherlock Holmes intelligence you will deduce, quite accurately, that I have carefully and conscientiously reduced a B.E. 2 c to its molecular constituents—in other words, 'crashed it.' Don't worry, as I am perfectly all right and thoroughly enjoying life."

There is room on my book-shelves for any other books "Theta" may care to write, so that he stick to his own way of writing, and I offer him congratulations and thanks. I could wish that his book had been published in stiff covers, as paper covers are my special abomination. Still, if the picture be good, perhaps it does not so greatly matter about the frame.

I think that if I were a drawer of pictures I should insist on choosing the frames myself, because the frame is a part of the picture in so far as it, as the case may be, helps on or destroys the effect aimed at. It seems to me that nobody has a right to frame another man's picture.

Happily the writers of books do not have their tenderest feelings hurt through somebody else supplementing their work. An author writes his work and there it is, his from cover to cover. It is true that all covers are not beautiful, but they cannot deteriorate the work inside, which will please or otherwise, according to the skill of the author in setting down his thoughts in his own way, without reference to Brewster or anybody else as to how it should be done.

atom behind his trenches, but only lines upon lines of defences made by slave labour and bands of wire as much as 50 yards deep. These look like belts of young timber."

Mr. Philip Gibbs, writing on the same date, said :—

"The enemy is again favoured by the weather conditions. A sharp frost last night has condensed all the vapour from the waterlogged ground and caused a heavy fog over all the battlefields, preventing aeroplane and artillery observation."

The Move on Baupaume.

Writing to the *Daily Mail* from France on March 2nd, Mr. W. Beach Thomas says :—

"Here it is more than manifest that the German is off because he is afraid of losing men and losing positions, and he shows all the devices of the hunted creature. He is furtive and tricky; he moves only at night."

"Looking from an aeroplane by day you see no moving

AIRISMS

FROM THE FOUR WINDS

SOMEONE points out that the first item in the index to the Year Book issued by the Royal Aero Club is "Accidents, Fatal: British," and suggests that the well-known Army formula, "Officers, for the use of," might be added. A gruesome jest, indeed, but every aviator is an optimist, and trifles like this will not discourage him.

It is reported on good authority that a pilot of the R.N.A.S. recently climbed to a height of 26,000 ft. on a Sopwith biplane. He went up from an aerodrome "somewhere in the South of England," and after a rapid descent was extremely annoyed to find that, in his own words, "somebody had moved England." He cruised about for some time without being able to find his native land, and eventually came down in the sea just off the French coast and was rescued. Unfortunately he was not carrying a recording barograph, and therefore his flight does not constitute an official record, but it was a fine performance.

THE King and Queen last week, attended by the Countess of Airlie and Commander Sir Charles Cust, Bart., R.N., paid a sympathetic visit to that admirable institution the Royal Flying Hospital, 37, Bryanston Square.

A "STAR" flyer has disappeared, and we would urge any reader who may hear of his whereabouts to at once communicate with Flight-Commander Colmore, at 117, Westbourne Grove. We would explain that this particular "Star" is a very lovable wire-haired "mascot dog" much prized by its owner, and as Star's greatest recreation is to be with his master in the air—he having already made a dozen or more trips up above—it is to be hoped Star will be speedily restored to his proper sphere. Needless to say a reward is awaiting the restorer—and as we're not the owner, if desired, no questions asked.

"If Labour and Capital can die together, why the—can't they live together?" The foregoing rather pertinent query was told by Mr. H. A. Gwynne, editor of the *Morning Post*, when speaking the other day at the Junior Constitutional Club, as an original criticism of the Capital v. Labour question, by a rabid Socialist wounded in France. And a good many will say "Hear, hear" to so healthy a proposition.

It is none too early for British enterprise to move forward in new channels likely to be to the benefit of this Empire after the war. It is only by the most strenuous efforts that the Germans will be kept under in the future fight for trade. As might have been expected, Messrs. Vickers, Ltd., are looking well ahead, and one of the latest directions of their development is in the country of one of our Allies, Italy, in such a connection as is likely to be of vast consequence to all commercial undertakings. Sir Vincent Caillard and Mr. F. Barker, two of the directors, have been elected directors of the Società per le Imprese Idrauliche ed Elettriche del Tirso and of the Società per le Forze Idrauliche della Sila, in which companies the Banca Commerciale Italiana and its industrial group are largely interested. The object of the two companies, to whom special concessions have been made by the Italian Government, is the development of hydro-electric power for industrial purposes, and also for agricultural irrigation in Sardinia and the southern provinces of Italy. Hydro-electric power stations will be erected to develop the power of the Rivers Tirso in Sardinia and Sila in Calabria. The two companies have already got to work on an ambitious programme, which, with the participation of British capital and enterprise, is expected to apply a great stimulus to industrial expansion in Southern Italy and Sardinia after the war.

THE co-ordination of Naval and Military Aircraft Supplies has been even more firmly cemented under the Air Board by the appointment of Mr. Arthur E. Turner as Director of Aircraft Contracts, thus controlling contracts for both services. Mr. Turner is anything but new to the work, as for a long time past he has been at the head of this department so far as the War Office is concerned, and will under his new appointment control both War Office and Admiralty contracts for aircraft and their appurtenances.

It was a pretty emphatic lie direct to the assertion of The Press Photographers Association Council which Mr. Mac-

pherson gave on February 28th in Parliament to the statement that the photographs of the King's recent visit to the City secured by R.F.C. men were distributed to the newspapers for publication—presumably for the usual consideration.

WONDER what the explanation of the P.P.A.C. will be in reply. Also wonder whether the "special facilities" granted to R.F.C. men upon this—and other—occasions and refused professional photographers have anything behind them.

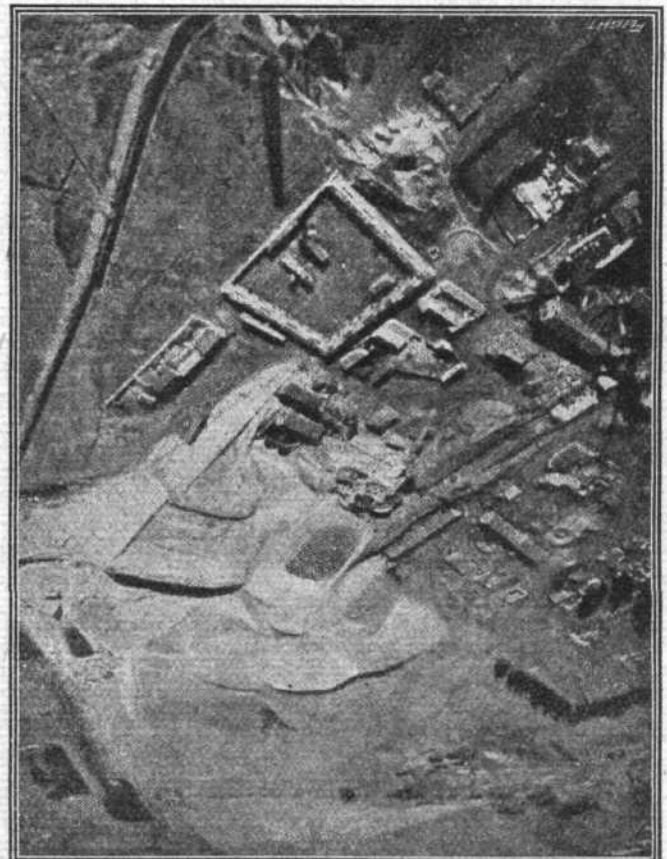
IN view of the beating up of all General Service men, perhaps a little more light might usefully be let in upon the orders which necessitate the taking of very ordinary every-day "snaps" by presumably young men suitable for more serviceable war work.

By permission of the Commander-in-Chief of the Southern Command, the Bishop of Winchester will now be able to resume the ringing of Church bells in his diocese until 9 p.m. The residents should indeed have reason to rejoice.

ANOTHER change in the Chairmanship of the Parliamentary Air Committee. Mr. Wilfred Ashley having been appointed Private Secretary to Mr. H. W. Forster, Financial Secretary to the War Office, Mr. Joynson-Hicks has accepted the vacant Chairmanship of the Air Committee.

A LOADING of bombs is an ugly freight with which to negotiate a forced landing, so perhaps it was only a recognised refinement of Hunnish Kultur when recently a German air squadron, attacked by British airmen on the Western front, in the heat of the fight, saw fit to release their bombs, although the scrap was well over the German lines. According to report there was "great havoc." We hope so.

ONCE again a monthly analysis is made by the *Times* of the air losses in February, which appear to have been normal. Mist and fog have greatly hampered bombing raids and battery spotting, the fruitful occasions of air fights. According to the daily official reports of British General Headquarters, the French Ministry of War, and German Main



What a Gold Mine looks like from an aeroplane. A photograph taken near Johannesburg in South Africa.

Headquarters, 89 aeroplanes were accounted for during February. In January the losses officially recorded were 88, and in December 72.

Of the 89 machines which came involuntarily to earth, 60 belonged to the German Flying Service. British airmen claimed 41 of these, and the French 19. The following particulars of those which fell to our airmen are official:—Eight were destroyed, 27 were driven down damaged, three came down in our lines, one was brought down by anti-aircraft guns, and two were brought down in air fights. Oddly enough, the British Flying Service accounted for the same number in January. Our successes were largely in excess of our losses. Last month 23 British machines were reported as "missing" or "brought down." In January the proportion was 41 to 15, in December 35 to 10, and in November 57 to 32.

THE French successes were classified as follows:—One destroyed (in flames), 13 brought down, three fell in French lines, and two by anti-aircraft guns. It is almost certain that many of those brought down were also wrecked.

THE number of Allied machines officially claimed by German Main Headquarters, partly in air fights and partly by anti-aircraft fire, was 29. An interesting feature of the German *communiqués* for last month was that, for the first time since Boelke's death in October, an airman was singled out for mention by name. This was Lieutenant von Richthofen, who was said, on February 15th, to have achieved his 20th and 21st victories. It is worth pointing out that none of Richthofen's previous successes has been officially mentioned.

DURING the month the French airman Guynemer received well-deserved promotion to the rank of captain. He has 30 German "victims" to his credit, and, though he did not improve his position in February, he is still well ahead on the list of French airmen.

WHILST the affairs of the Deutsche Bank in London still remain in a state of "suspended animation," the head office in Berlin is busy keeping things financial moving, and is particularly interested in the welfare of the Zeppelins and their constituent parts, doubtless having in mind a little revenge on their own as a set off against London's treatment of their secret service branch in England's metropolis. Under the heading "Do not Forget our Zeppelins," an appeal for subscriptions is issued by the bank for the widows and children of "the German airmen who in an attack on London lose their lives and so help to make Germany's most cunning enemy, who has hitherto felt himself safe behind the silver girdle of the sea which encircles his island, feel the horrors of the war which he let loose in Europe." Judging by general results, however, the appeal is not creating any wild rush to subscribe, in fact it may be stated to have fallen very flat indeed. In Cologne, an individual interest is reported by the *Cologne Gazette*, it being recorded that "One of our fellow-citizens, who wishes to remain anonymous, has given, in addition to a large sum for our U-boat crews, £1,000 to help to support the families of any Zeppelin men who may lose their lives in an attack on London and thus assist in making our worst enemy feel the horrors of war on his own body. The great-hearted benefactor hopes that many Germans who, like him, expect an early and victorious peace through the efforts of our U-boats and Zeppelins, will follow his example." The affair is quite official, you know, as the appeal notifies that contributions should be paid in to the account of the General Commanding our Air Forces, Deutsche Bank, Berlin.

It is to be hoped human-made monoplanes will not be stricken in these war times with microsporidiosis, in like manner to one of nature's mono's, else might they all be decimated and our aerial fighting powers come to an untimely end, after the fashion ascribed by protozoologists to the common or garden bee. And the worst of it would be, that for the moment things would have to go at that, as the

Air Work in Kut Retreat.

In his report of the retreat of the Turks from Kut, Mr. Edmund Candler, writing from a bivouac, west of Shumran, on February 25th, says:—"Our aeroplanes, flying low, harried the retreating Turks, dropping bombs on them and emptying their Lewis guns into their ranks."

Another Zeppelin Reported Lost.

A MESSAGE from Amsterdam on March 2nd stated that according to Belgian correspondents a new Zeppelin, while

report upon an antidote is for the time being hung up. This emerged in the House last week in response to an enquiry by Sir W. Essex from the Parliamentary Secretary of the Board of Agriculture as to the progress of the enquiry into that virulent apian scourge, known as the Isle of Wight disease, when Sir R. Winfrey announced that the Board's expert adviser on protozoology—who appears to be one of the gentler sex—had flitted at short notice to South Africa, whence the report had been promised to be sent later on.

A WORLD'S record stands to the credit of a well-known British pilot whose name under present regulations perhaps had better be left blank. At a London aerodrome this week, with one passenger, he attained the altitude of 21,000 feet. The previous record, so far as can be ascertained in these strenuous times, was held by Lieut. Bier, with an altitude of 20,237 feet.

TEN YEARS AGO.

Excerpts from the "Auto." ("FLIGHT's" precursor and sister *Journal*) of March, 1907. "FLIGHT" was founded in 1908.

THE KAPFERER AEROPLANE.

Of the machine designed by M. Henri Kapferer—engineer to M. Henri Deutsch—the following details will be of general interest. It is composed of two superposed aerocurves. The length of the upper aerocurve from end to end is 11 metres, the lower one being a metre less; the width of the surfaces is 1½ metres. The machine has a double horizontal rudder in front, connected to the main body of the aeroplane by a covered girder, which is pointed at the forward end. With a view presumably to increasing the horizontal stability, the Kapferer machine has copied the Blériot aeroplane in having, some distance to the rear, two superposed aeroplanes of the same width as the forward ones, but only 4 metres in length. These are connected by three vertical surfaces, one at each end and one in the middle, thus dividing the rear portion of the machine into two compartments. The motor is, as usual mounted in the centre of the aeroplane proper, and the propeller is situated just behind it. The propeller is two-bladed, the blades being mounted tangentially in the boss. The 24 h.p. Buchet motor has diagonal cylinders, the total surface of the aeroplane amounts to 24 square metres, and the entire machine is mounted on two bicycle wheels, to get up the necessary speed for starting. It is intended to replace the 24 h.p. motor subsequently by a 50 h.p. machine.

ACCIDENT TO THE DELAGRANGE AEROPLANE.

The Delagrange aeroplane went out on the last day of February, at a quarter to four, in the presence of MM. Santos Dumont, Archdeacon, Kapferer, and others. It was mounted by M. Gabriel Voisin, who sat on a small saddle almost in the middle of the machine, and, the motor being started, the aeroplane got under way at tolerably high speed, running on the three wheels which form its support. A speed of 20 kiloms. per hour was soon attained, and after travelling some 60 metres over the rough ground, which was very bumpy, the whole construction doubled up. The exact causes of the catastrophe are not at present clear, though it would seem probable that the running on three wheels had something to do with it, that the front wheel was too far in advance of the others, and that the whole structure was not strong enough. M. Voisin was fortunate enough to jump off in time to avoid being injured.

THE VUIA AEROPLANE.

The Vuija aeroplane was successful on the 2nd of March in leaving the ground and proceeding in flight some few yards through the air. At ten o'clock it went out at Bagatelle in a rather thick mist, and being run at speed over the ground first of all, rose about a metre from the surface and effected a flight or leap of five metres in length before again touching, while on another flight the height attained above the ground amounted to some two metres, and the distance travelled in free flight to ten. The machine consists of a single aerocurve spread out like a bat's wings, and is driven by a 12 h.p. carbonic acid motor.

making speed trials at Ghent on February 26th, caught fire and was completely destroyed, the crew being burned to death. It is also stated that two Belgians who were reported as having witnessed the fire were arrested and taken to Germany. The story, however, lacks confirmation.

Dutch Buying Aeroplanes from Sweden.

THE *Dagens Nyheter* is the authority for a statement to the effect that Holland has placed an order with a Swedish factory for 120 aeroplanes.

AVIATION IN PARLIAMENT.

The Royal Flying Corps.

IN his speech introducing the Army Estimates in the House of Commons on March 1st, Mr. Forster, Financial Secretary to the War Office, made the following reference to the work of the Royal Flying Corps:—

As far as the Royal Flying Corps is concerned, the supply of personnel, both officers and men, has been maintained, although the provision of skilled mechanics in sufficient quantities has presented difficulties, which I think have been overcome. The importance of this cannot be overstated, for while, of course, troops of all kinds contribute their quota to the success of the whole Army, none do more valuable or more conspicuous work than the Royal Flying Corps in all the theatres of war. We all recognise their intrepid daring and indifference to danger, which is only equalled by the skill with which they carry out their perilous duty, and the value of their work both to the Army in the field and to the safety of our people at home. The training of officers in flying has been very largely expanded, and the main difficulty that we have had to face in this connection has been that of providing suitable aerodromes and buildings. It may interest the House to know that we are establishing new flying schools in Canada and in Egypt, and I should like to take this opportunity of acknowledging the valuable services of the large number of colonial pilots in the Flying Corps. There has been some difficulty and delay in obtaining the necessary aircraft and their appurtenances, in spite of the assistance which has been given to us by the Ministry of Munitions, but I hope these difficulties have now been overcome. The formation of the Air Board, with extended powers, and the entrusting of the practical business of the supply of aircraft both for the Navy and Army to the Ministry of Munitions will, it is hoped, give the Air Services that priority which their importance demands. The policy of instituting an Air Board has for some time had the firm support of the Army Council, and although the new arrangement has been in force only for a week or two its influence is already having effect. It must be remembered, however, that whatever the efforts of the Air Board and the Ministry of Munitions, they cannot be expected to show at once a greatly increased output. Anti-aircraft stations have been installed at various points, and though the actual buildings are only a few huts and offices in each case, there is much work involved in connection with electrical connections and other accessories, which is not always a matter of easy arrangement in isolated country districts. I am not going to boast about what might happen in the event of renewed Zeppelin raids, but we have profited to the full by the experience that we have gained.

The Government Aircraft Insurance Scheme.

MR. RAFFAN, in the House of Commons on February 27th, asked the Chancellor of the Exchequer whether premiums have been reduced 50 per cent. on all new aircraft policies taken out under the Government scheme on and after February 17th and on all renewals falling due after that date; whether a number of renewal premiums have been paid on the old terms on recent dates but prior to 17th February; and if so, whether, to obviate the sense of injustice which

would otherwise be felt, some rebate will be allowed in all such cases?

MR. ROBERTS: My right hon. friend has asked me to answer this question. For the present a rebate of 50 per cent. is being given on all new insurances or renewals effected under the Government aircraft insurance scheme on and after February 17th. This is in effect a reduction in rate, and as such must take effect as from one particular date. From the nature of the case, it is not possible to extend this reduction to insurances or renewals effected before that date.

SIR J. HARMOOD-BANNER asked the Chancellor of the Exchequer, whether persons paying enemy aircraft insurance immediately before February 12th at the original rate will be entitled to a rebate in respect of the reduction of 50 per cent. which came into force on February 12th?

MR. ROBERTS: My right hon. friend has asked me to answer this question. Persons who have paid premium under the Government aircraft insurance scheme prior to February 17th will not be entitled to a rebate except in cases in which the premium was paid in advance in respect of a renewal which did not fall due before February 17th.

R.F.C. Photographs and the Press.

MR. TYSON WILSON, on February 28th, asked the Under-Secretary of State for War whether he is aware that men attached to the Royal Flying Corps have been allowed to engage in photographing public functions, such as the recent Royal visit to the City, in opposition to the professional Press photographers; whether the act of contributing to the Press is a violation of the regulations; whether the practice referred to had the sanction of the War Office; and whether he will take steps to prevent this competition with men who are dependent upon the work for their livelihood?

MR. MACPHERSON: I think my hon. friend is under a misapprehension. Certain photographs of the recent Royal visit were taken by the Royal Flying Corps for official purposes. None of these photographs were sent to the Press, and the last part of the question does not, therefore, arise.

Royal Flying Corps (Medical Examination).

MR. WATT, on March 5th, asked the Parliamentary representative of the Air Board whether his attention has been called to the inconvenience and expense entailed on candidates in Scotland for service in the Air Department, in that they have to come to London to be interviewed and medically examined, which practice puts Scotland and other parts of the United Kingdom situated far from London at a disadvantage as compared with the Home Counties; and will he make or suggest some arrangement whereby the examining medical man will go to such candidates at stated intervals?

MR. MACPHERSON: A special medical examination is necessary for candidates for the Royal Flying Corps in view of the special circumstances of that arm. This has been held hitherto before a candidate was accepted; but it has now been decided to accept candidates passed fit for general service and to hold the special medical examination during their cadet course. Candidates will, therefore, be interviewed in other places than London.

Fogs.

IN his lecture before the Aeronautical Society of Great Britain on February 28th, Major G. I. Taylor, who is attached to the R.F.C. for meteorological duties, dealt with many interesting questions in connection with fogs.

Fogs, he said, are due either to precipitation of water in the air or to a condition of the atmosphere which prevents smoke from being dispersed from the air close to the roofs of a town. Two conditions are necessary for the formation of a smoke fog: the wind velocity must be very small and the air near the ground must be relatively cold compared with the air higher up for a period sufficiently long to collect enough smoke to form a fog.

Fogs which consist of small drops of water are formed when air containing water vapour is cooled. On land they occur only in very light winds, but at sea they may occur in a wind of nearly gale force. This because a high wind prevents the temperature of the ground from going down at night, whereas it has very little effect on the temperature of the sea.

It might be expected that fog would be produced on a clear still night when the temperature of the air has fallen below the dew point found in the evening after the wind had died down. This is a mistake. The cooling effect of the ground spreads upwards by means of vertical currents. Directly

the ground gets to the dew point of the air above it, dew is condensed on the ground and the air in currents rising off the ground is drier than the surrounding air. Fog is really due to a mixture between cold, comparatively dry air rising off the ground and the warmer, moister air above. A diagram is given which shows that it is to be expected that fog will not appear till the ground has cooled a long way below the dew point of the air above.

To forecast whether a fog will appear on an aerodrome during the night, it is necessary to find the dew point by observation with wet and dry bulb thermometers. The amount by which the temperature must fall below the dew point before fog can be produced is found next; and one must then forecast whether the temperature of the air will fall far enough to allow the fog to form, and if so, how long it will be before it does so. These operations are simplified by using a diagram from which the forecast can be read off at once.

This can be used to predict almost with certainty that fog will not appear on certain nights, and that it will not appear for several hours after the observations are taken on certain other nights; but it will predict several fogs which will not materialise. It might be of some use to Flight-Commanders in deciding how long they may tell their night patrols to stay up.

METHODS OF MEASURING AIRCRAFT PERFORMANCES.*

By Captain H. T. TIZARD, R.F.C.

Aeroplane Testing.

THE accurate testing of aeroplanes is one of the many branches of aeronautics which have been greatly developed during the war, and especially during the last year. For some months after the war began a climb to 3,000 to 5,000 ft. by aneroid and a run over a speed course was considered quite a sufficient test of a new aeroplane; now we all realise that for military reasons certainly, and probably for commercial reasons in the future, it is the performance of a machine at far greater heights with which we are mainly concerned. In this paper I propose to give a short general account of some of the methods of testing now in use at the Testing Squadron of the Royal Flying Corps, and to indicate the way in which results of actual tests may be reduced, so as to represent as accurately as possible the performance of a machine independently of abnormal weather conditions, and of the time of the year. For obvious reasons full details of the tests and methods employed cannot yet be given. So far as England is concerned, I believe that the general principles of what may be called the scientific testing of aeroplanes were first laid down at the Royal Aircraft Factory. Our methods of reduction were based on theirs to a considerable extent, with modifications that were agreed upon between us; they have been still further modified since, and recently a joint discussion of the points at issue has led to the naval and military tests being co-ordinated, so that all official tests are now reduced to the same standard. It should be emphasised that once the methods are thought out scientific testing does not really demand any high degree of scientific knowledge; in the end the accuracy of the results really depends upon the flyer, who must be prepared to exercise a care and patience unnecessary in ordinary flying. Get careful flyers whose judgment and reliability you can trust and your task is comparatively easy; get careless flyers and it is impossible.

At the outset it may be useful to point out by an example the nature of the problems that arise in aeroplane testing. Suppose that it is desired to find out which of two wing sections is most suitable for a given aeroplane. The aeroplane is tested with one set of wings, which are then replaced by the other set, and the tests repeated some days later. The results might be expressed thus:—

	A Wings.	B Wings.
Speed at 10,000 ft. . .	90 m.p.h.	93 m.p.h.
Rate of climb at 10,000 ft. . .	250 ft. a minute.	300 ft. a minute.

Now, the intelligent designer knows, or soon will know, that, firstly, an aneroid may indicate extremely misleading "heights"; and, secondly, that even if the actual height above the ground is the same in the two tests, the actual conditions of atmospheric pressure and temperature may have been very different on the two days. He will therefore say, What does that 10,000 mean? Do you mean that your aneroid read 10,000 ft., or do you mean 10,000 ft. above the spot you started from, or 10,000 ft. above sea-level? If he proceeds to think a trifle further he will say, What was the density of the atmosphere at your 10,000 ft.; was it the same in the two tests? If not, the results do not convey much. There he will touch the keynote of the whole problem, for it is on the density of the atmosphere that the whole performance of an aeroplane depends; the power of the engine and the efficiency of the machine depend essentially on the density, the resistance to the motion of the machine through the air is proportional to the density, and so finally is the lift on the wings. None of these properties are proportional solely to the pressure of the atmosphere, but to the density—that is, the weight of air actually present in unit volume. It follows that it is essential when comparing the performances of machines to compare them as far as possible under the same conditions of atmospheric density, not as is loosely done at the same height above the earth, since the density of the atmosphere at the same height above the earth may vary considerably on different days, and on the same day at different places.

At the same time, in expressing the final results, this principle may be carried too far. Thus, if the speed of a machine were expressed as 40 metres a second at a density of 0.8 kilogs. per cubic metre, the statement, though it may be strictly and scientifically accurate, will convey nothing to 99 per cent. of those directly concerned with the results of the test. The result is rendered intelligible and, indeed, useful by the form "90 m.p.h. at 10,000 ft.," or whatever it

is. With this form of statement, in order that all the statements of results may be consistent and comparative, we must be careful to mean by "10,000 ft." a certain definite density—in fact, the average density of the atmosphere at a height of 10,000 ft. above mean sea-level. This is what the problem of "reduction" of tests boils down to: what is the relation between atmospheric density and height above sea-level? This knowledge is obtained from meteorological observations. We have collected all the available data, mostly unpublished, with results shown in the following table:—

TABLE I.—Mean Atmospheric Pressure, Temperature and Density at various Heights above Sea-Level.

Height in Kiloms.	Height in equivalent feet.	Mean pressure in millibars.	Mean temp. in absolute degrees Centigrades.	Mean density in kgm. per cubic metre.
0	0	1,014	282	1.253
1	3,280	900	278	1.128
2	6,560	795	273	1.014
3	9,840	699	268	0.909
4	13,120	615	262	0.818
5	16,400	568	255	0.735
6	19,680	469	248	0.658
7	22,960	407	241	0.589

These are the mean results of a long series of actual observations made mainly by Dr. J. S. Dines. It is convenient to choose some density as standard, call it unity, and refer all other densities as fractions or percentages of this "standard density." We have taken, in conformity with the R.A.F., the density of dry air at 760 mm. pressure and 16° C. as our standard density; it is 1.221 kilog. per cubic metre. The reason this standard has been taken is that the air speed indicators in use are so constructed as to read correctly at this density, assuring the law: $p = \frac{1}{2} \rho V^2$, where V is the air speed, p the pressure obtained, ρ the standard density.

In some ways it would doubtless be more convenient to take the average density at sea-level as the standard density, but it does not really matter what you take so long as you make your units quite clear. Translated into feet, and fraction of the standard density, the above table becomes:—

TABLE II.

Height in feet.	Percentage of standard density.	Height in feet.	Percentage of standard density.	Height in feet.	Percentage of standard density.
0	102.6	7,000	81.9	15,000	63.0
1,000	99.4	8,000	79.2	16,000	61.1
2,000	96.3	9,000	76.5	16,500	60.1
3,000	93.2	10,000	74.0	17,000	59.1
4,000	90.3	11,000	71.7	18,000	57.1
5,000	87.4	12,000	69.5	19,000	55.2
6,000	84.6	13,000	67.3	20,000	53.3
6,500	83.3	14,000	65.2		

Let us briefly consider what these figures mean. For example, we say that the density at 10,000 ft. is 74 per cent. of our standard density, but it is not meant that at 10,000 ft. above mean sea level the atmospheric density will always be 74 per cent. of the standard density. Unfortunately for aeroplane tests this is far from true. The atmospheric density at any particular height may vary considerably from season to season, from day to day, and even from hour to hour; what we do mean is that if the density at 10,000 ft. could be measured every day, then the average of the results would be, as closely as we can tell at present, 74 per cent. of the standard density.

The above table may therefore be taken to represent the conditions prevailing in a "normal" or "standard" atmosphere, and we endeavour, in order to obtain a strict basis of comparison, to reduce all observed aeroplane performances to this standard atmosphere, i.e., to express the final results as the performance which may be expected of the aeroplane on a day on which the atmospheric density at every point is equal to the average density at the point. Some days the aeroplane may put up a better performance, some days a worse, but on the average, if the engine power and other characteristics of the aeroplane remain the same, its performance will be that given.

It must be remembered that a standard atmosphere is a

* 6,500 ft. is introduced as corresponding roughly to the French test height of 2,000 metres. 10,000 ft. similarly corresponds roughly to comparing aeroplane test performances to the French standard of 3,000 metres, and similarly for 13,000 and 16,500 ft.

* Paper read before the Aeronautical Society of Great Britain on March 7th.

very abnormal occurrence; besides changes in density there may occur up-and-down air currents which exaggerate or diminish the performance of an aeroplane, and which must be taken carefully into account. They show themselves in an otherwise unaccountable increase or decrease in rate of climb or in full speed flying level at a particular height.

We now pass to the actual tests, beginning with a description of the observations which have to be made and thereafter to the instruments necessary. The tests resolve themselves mainly into (a) A climbing test at the maximum rate of climb for the machine. (b) Speed tests at various heights from the "ground" or some other agreed low level upwards.

Experience agrees with theory in showing that the best climb is obtained by keeping that which is frequently called the air speed of an aeroplane, viz., the indications of the ordinary air speed indicator, nearly constant whatever the height—in other words, ρV^2 is kept constant. We can look at this in this way. There is a limiting height for every aeroplane above which it cannot climb; at this limiting height, called the ceiling of the machine, there is only one speed at which the aeroplane will fly level, at any other air speed higher or lower it will descend. Suppose this speed be 55 m.p.h. on the air speed indicator. Then the best rate of climb from the ground is obtained by keeping the speed of the machine to a steady indicated 55 m.p.h. Fortunately a variation in the speed does not make very much difference to the rate of climb; for instance, a B.E.2c with a maximum rate of climb at 53 m.p.h. climbs just as fast up, say, to 5,000 ft. at about 58 m.p.h. This is fortunate as it requires considerable concentration to keep climbing at a steady air speed, especially with a light scout machine; if the air is at all "bumpy" it is impossible. At great heights the air is usually very steady, and it is much easier to keep to one air speed. It is often difficult to judge the best climbing speed of a new machine; flyers differ very much on this point, as on most. The Testing Squadron, therefore, introduced some time ago a rate of climb indicator intended to show the pilot when he is climbing at the maximum rate. It consists of a thermos flask, communicating with the outer air through a thermometer tube leak. A liquid pressure gauge of small bore indicates the difference of pressure between the inside and outside of the vessel. Now, when climbing, the atmospheric pressure is diminishing steadily; the pressure inside the thermos flask tends therefore to become greater than the outside atmospheric pressure. It goes on increasing until air is being forced out through the thermometer tubing at such a rate that the rate of change of pressure inside the flask is equal to the rate of change of atmospheric pressure due to climbing. When climbing at a maximum rate, therefore, the pressure inside the thermos flask is a maximum. The pilot therefore varies his air speed until the liquid in the gauge is as high as possible, and this is the best climbing speed for the machine.

What observations during the test are necessary in order that the results may be reduced to the standard atmosphere? Firstly, we want the time from the start read at intervals, and the height reached noted at the same time. Here we encounter a difficulty at once, for there is no instrument which records height with accuracy. The aneroid is an old friend now of aeronauts as well as of mountaineers, but although it has often been tentatively exposed, it is doubtful whether 1 per cent. of those who use it daily realise how extraordinarily rare it is that it ever does what it is supposed to do, that is, indicate the correct height above the ground, or starting place. The faults of the aeroplane aneroid are partly unavoidable and partly due to those who first laid down the conditions of its manufacture. An aneroid is an instrument which in the first place measures only the pressure of the surrounding air. Now if p_1 and p_2 are the pressures at two points in the atmosphere, the difference of height between these points is given very closely by the relation, $h = \theta \log_e p_1/p_2$ where θ is the average temperature, expressed in "absolute" degrees, of the air between the two points. It is obvious that if we wish to graduate an aneroid in feet we must choose arbitrarily some value for θ . The temperature that was originally chosen for aeroplane aneroids was 50° F. or 10° C. An aneroid, as now graduated, will therefore only read the correct height in feet if the atmosphere has a uniform temperature of 50° F. from the ground upwards, and it will be the more

inaccurate the greater the average temperature between the ground and the height reached differs from 50° F. Unfortunately 50° F. is much too high an average temperature; to take an extreme example, it is only on the hottest days in summer, and even then very rarely, that the average temperature between the ground and 20,000 ft. will be as high as 50° F. On these very rare occasions an aneroid will read approximately correctly at high altitudes; otherwise it will always read too high. In winter it may read on cold days 2,000 ft. too high at 16,000 ft., i.e., it will indicate a height of 16,000 ft. when the real height is only 14,000 ft. It is always necessary therefore to "correct" the aneroid readings for temperature. The equation

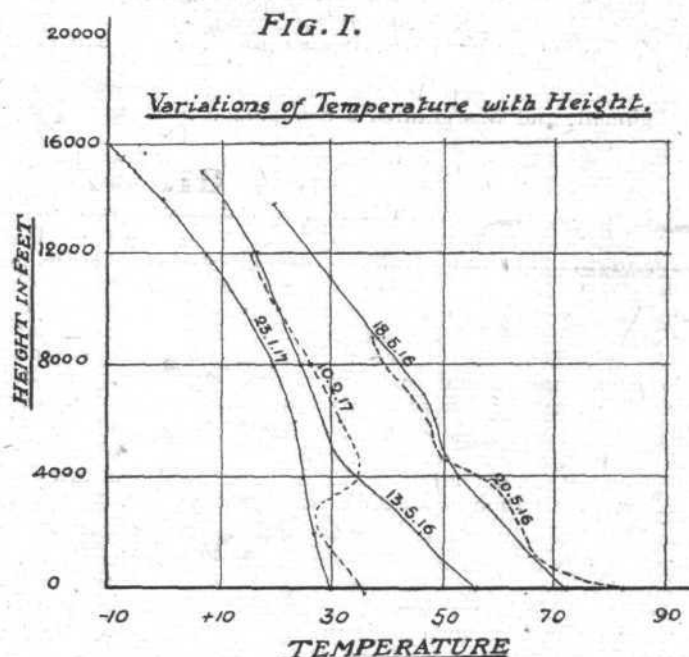
$$H = \frac{273 + t}{283} \cdot h$$

gives us the necessary correction. Here H is the true difference in height between any two points, t the average temperature in degrees Centigrade between the points, and h the difference in height indicated by aneroid. It is convenient to draw a curve showing the necessary correction factors at different temperatures, some of which are given below:—

TABLE III.—Aneroid Correction Factors.

Temperature ° F.	Correction factor.	Temperature ° F.	Correction factor.
70	1.040	10	0.922
50	1.000	-10	0.883
30	0.961		

For example if a climb is made through 1,000 ft. by aneroid and the average temperature is 10° F., the actual distance in



feet is only $1,000 \times 0.922 = 922$ ft. The above equation is probably quite accurate enough for small differences of height—up to 1,000 ft. say—and approximately so for bigger differences. The magnitude of the correction which may be necessary shows how important it is that observations of temperature should be made during every test. For this purpose a special thermometer is attached to a strut of the machine, well away from the fuselage, and so clear of any warm air which may come from the engine. The French, I believe, do not measure temperature, but note the ground temperature at the start of a test, and assume a uniform fall of temperature with height. This, undoubtedly, may lead to serious errors. The change of temperature with height is usually very irregular, and only becomes fairly regular at heights well above 10,000 ft. This is shown by the following curves, which represent results taken at random from tests made at different times (Fig. 1).

(To be continued.)

"High Speed Internal Combustion Engines."

UNDER this title Mr. A. W. Judge, whose book "The Design of Aeroplanes" has met with much appreciation from the aircraft world, has written a volume presenting the more important information relating to the subject of high speed internal combustion engines. This subject is one of vast importance at the present moment, and as there appears to be in modern aero engine design a tendency towards higher

speeds, many of the data relating to the older, slower running engines need re-viving. In the present volume the author has collected and analysed the more important of the available theoretical and experimental results, and, realising the influence of experimental work on design, has included a chapter on methods of measuring pressures inside the cylinders of high speed engines. The book, published by Whittaker and Co., is obtainable from the offices of "FLIGHT," for 15s. 6d., post free.

Personals.

Under the above heading will be published weekly particulars of a personal character relating to those who have fallen or have been wounded in the country's service, announcements of marriage and other items concerning members of the Flying Services and others well known in the world of aviation. We shall be pleased to receive for publication properly authenticated particulars suitable for this column.

Casualties.

Second Lieutenant EDWARD VINCENT BAYLEY, South Staffordshire Regiment, attached R.F.C., whose death is reported as the result of an accident while flying abroad, was a member of Keith, Bayley and Reader, of the Stock Exchange. The second son of Mr. James Bayley, of Willaston Hall, Cheshire, he joined the South Staffordshire Regiment, and six months ago was attached to the R.F.C. A never-tiring worker in business, he was a keen sportsman, being a first-rate shot and horseman.

Lieutenant TREVOR M. BENNET, M.C., 10th Battalion Royal Irish Rifles (South Belfast), attached R.F.C., previously reported missing, is now officially reported to have been shot down in aerial combat at Rocquigny, France, on November 10th last, and was buried at that place. Nineteen years of age, he was a son of Mr. James Bennet, University Road, Belfast, and was educated at the Royal Academical Institution.

Lieutenant T. SEAMAN GREEN, N. Staffordshire Regiment and R.F.C., whose death in action on February 13th is announced, was elder son of Councillor and Mrs. T. S. Green, Nile Street, Burslem. Lieutenant Green, who was 22 years of age, was educated at King William's College, Isle of Man, where he was a marksman and won the Chili Cup for shooting two years in succession. He also played scrum half in the first XV., and was in the college swimming eight. He enlisted on the outbreak of war in the North Staffordshire Regiment, and was granted a commission in the regiment in December, 1914, being transferred to the R.F.C. in January, 1915. He had been serving as a pilot at the Front since last June, gaining his second star in September. For the last few weeks he has been acting Flight-Commander of his squadron. He was known by his brother officers as "the lad of the squadron," and, according to their reports, has done fine service and has displayed conspicuous bravery. It was he who was deputed to carry over and drop a wreath to the memory of Capt. Boelcke, the famous German aviator, in the performance of which he went 17,000 yards over the German lines without an escort. Although Lieutenant Green was an artillery observation scout, who is not supposed to fight, he succeeded, amongst other feats, in bringing down five enemy aeroplanes and an observation balloon, and was personally commended by Sir Douglas Haig for his work. He was also recommended for the Military Cross.

Lieutenant WALTER A. PORKESS, R.F.C., whose death in active service is announced, was the youngest son of Mr. U. Porkess, builder, of Grimsby. He was on the staff of Messrs. Ambrose Heal and Son, Tottenham Court Road, London, when he enlisted soon after the outbreak of war. After six months in the ranks of the Royal Bucks Hussars he was transferred to the Inns of Court O.T.C., and later got a commission in the Sherwood Rangers Yeomanry, from which he went to the R.F.C. Here he made rapid progress, and won his "wings" in a very brief time, and was soon sent over to France on active service. After six months of strenuous flying he came over for a well-earned Christmas leave, returning to the Front early in January.

Flight Lieutenant EDWARD L. PULLING, D.S.O., R.N., killed on service, was an old boy of St. Anne's, Redhill. He was born in Devonshire, and before receiving his commission in August last year was in the Government wireless service. Flight Lieutenant Pulling was awarded the D.S.O. last December for having, with Flight Lieutenant Egbert Cadbury and Flight Sub-Lieutenant Gerrard W. R. Fane, destroyed a Zeppelin off the Norfolk coast in the early morning of Tuesday, Nov. 28th, 1916.

Second Lieutenant F. GERALD RUSSELL, R.F.A. and R.F.C., announced as killed in action, was the eldest son of Hubert H. Russell, late 8th The King's Regiment, and was educated at Elmhurst, Torquay, and at Tenbridge School. In 1914 he went to New Zealand sheep farming, but on the outbreak of war he enlisted in the New Zealand Mounted Rifles, and was sent to Egypt, where he was promoted Sergeant. Soon after he obtained a commission in the R.F.A., and went to France, where he transferred to the R.F.C., and became a qualified Observer. He was wounded in an air fight in April, 1916, and afterwards gained his pilot's certificate

and "wings." Returning to the Front in November, 1916, he was killed on January 28th, 1917, while flying.

Second Lieutenant LAWRENCE D. RUSSELL, R.F.C., youngest brother of Second Lieutenant F. G. Russell, whose death is recorded above, was educated at Wanganui School, New Zealand, and at Wellington College, England, where he was in the shooting VIII, and gained the prize cup of his year, 1914. He obtained a commission in the R.F.C. in April, 1916, and in three months became an expert pilot and gained his "wings." He was at once sent to the Front, and after four weeks of most successful work was shot down by a shell, which killed his Observer. He managed, however, to bring his machine to the ground, but his own injuries were so severe that he died in hospital a week later, on September 2nd, 1916, aged 18. The only surviving son, Lieutenant H. B. Russell, R.F.A. and R.F.C., also a pilot, is a prisoner in Germany.

Lieutenant GERALD VAUGHAN-JONES, Royal Engineers, attached R.F.C. (killed in action on Feb. 26th), was youngest son of the late Colonel Edward Vaughan-Jones, V.D., of Hampstead, and of Mrs. Vaughan-Jones, of Myrtleberry, Pinner, Middlesex. He had his commission in the Engineers in October, 1915, and was gazetted Flying Officer in November last year.

Second Lieutenant H. B. H. COX, R.F.A. and R.F.C., the youngest son of Mr. G. W. S. Cox, J.P., of the Indian Police (retired), was accidentally killed on January 29th, while flying in England, owing to an accident to his machine. He was just about to proceed to the advanced part of the pilots' course. He was educated (1905-13) at Bedford School, where he distinguished himself by his ability and vigour, not only in work and games, but as Company Sergeant-Major in the O.T.C., and as head of the school. In 1913 he accepted an appointment at Selangor. On the outbreak of the war he returned to England, and was nominated to Woolwich. In 1915 he passed out into the Artillery, but was soon afterwards selected for the R.F.C. He was on active service in France for 10 months, and did excellent work in the region of the Somme.

Second Lieutenant JAMES LEONARD THOMAS, London Regiment, attached R.F.C. (accidentally killed whilst flying at Netheravon on February 28th), was fourth son of the Rev. S. Thomas, former vicar of Rushton, Staffordshire, and of Mrs. Thomas, Abingdon Road, Oxford. He had his commission in December, 1914.

Second Lieutenant HAROLD TOM WHITE, R.E., attached R.F.C. (accidentally killed while flying in England on February 27th), was the only son of Engineer Captain White, R.I.M., and of Mrs. White, of Lovedale, India. He joined the Hampshire Fortress Engineers in October, 1914, and received a commission in the same unit in March, 1915, and was attached to the Royal Flying Corps in August, 1916.

Wounded.

Lieutenant HENRY ERIC BAGOT, R.F.C., reported wounded, is the eldest son of Mr. Charles F. H. Bagot, Rochford House, Tenbury, and is a kinsman of Lord Bagot. He was born in 1893, and his first commission was in the Royal Artillery, but subsequently he went into the R.F.C., in which he has been a lieutenant since last October.

Married and to be Married.

Captain CEDRIC BOUSTEAD, Middlesex Regiment, attached R.F.C., third son of John Melvill and Leila Boustead, of Westfield, Wimbledon Common, and of Colombo, Ceylon, was on February 27th married at the Chapel Royal, Savoy, to DOROTHEA JOYCE, only child of Mr. and Mrs. HUSEY-HUNT, of Hove, Sussex.

The marriage arranged between Captain C. J. W. DARWIN, Coldstream Guards and R.F.C., and Miss SYBIL ROSE, will take place in the middle of April.

The marriage took place on February 26th at Holy Trinity Church, Leamington, of Squadron Commander G. R. BROMET, Royal Navy, son of Mr. and Mrs. G. Bromet, Tadcaster, Yorks, to MARGARET, eldest daughter of Lieutenant-Colonel R. and Mrs. RATLIFF, Lillington, Leamington Spa.

The British Air Service

"PER ARDUA AD ASTRA"

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

Royal Naval Air Service.

Admiralty, February 27th.

Temp. Flight Sub-Lieut. W. G. R. Hinchliffe appointed as Actg. Flight Lieut., to date Feb. 12th.

The under-mentioned entered as Prob. Flight Officers for temp. service, to date as stated: W. C. Wilson, G. W. Lavington, E. K. Green, F. W. Marsh, F. M. Williams, Feb. 25th; Air-Mech. E. E. Beale, Feb. 24th.

Admiralty, March 1st.

Flight-Com. J. J. Petree, D.S.C., re-appointed as Actg. Sqdn. Com., to date Feb. 27th.

The following re-appointed as Actg. Flight Coms., all to date Feb. 27th: C. B. Dalison, J. D. Newberry, F. J. E. Feeney, R. G. Mack, C. T. Maclaren, E. W. Norton, A. D. W. Allen, B. C. Clayton, F. Fowler, C. C. R. Edwards, G. E. Harvey and G. Thom.

L. Lanchester granted a temp. commission as Lieut., R.N.V.R., with seniority Feb. 28th.

The under-mentioned entered as Temp. Flight Officers for temp. service, and appointed to "President," additional, for R.N.A.S., all to date Feb. 27th: F. J. H. Ayscough, S. M. Bargeton, F. G. Redward and L. Chivers.

Admiralty, March 3rd.

R. Bissett and F. S. Wigley granted temp. commissions as Lieut., R.N.V.R., with seniority March 2nd.

G. C. Paish granted a temp. commission as Sub-Lieut., R.N.V.R., with seniority March 2nd.

W. R. M. Griffiths entered as Prob. Flight Officer for temp. service, to date Feb. 22nd.

Admiralty, March 5th.

Flight-Lieut. W. G. McMinnies, appointed Acting Flight-Com., to date Feb. 17th.

Temp. Lieut. (R.N.V.R.) W. E. G. Beauforte-Greenwood, to the "President," additional, for R.N.A.S., to date March 3rd.

Flight Sub-Lieut. J. S. Maitland and S. D. Scott, appointed Acting Flight-Lieut., to date Feb. 12th.

The following Temp. Prob. Flight Officers, promoted to Temp. Flight Sub-Lieuts., with seniority as stated: W. R. D. Acland, Nov. 15th; H. W. Taylor and H. F. Stackard, Dec. 7th; L. H. Slatter, Nov. 29th; and H. R. de Wilde, Dec. 27th.

S. F. P. Humphrey entered as Prob. Flight Officer for temp. service, and appointed to the "President," additional, for R.N.A.S., to date Feb. 24th.

P. White granted temp. commission as Lieut. R.N.V.R., with seniority March 3rd.

S. D. Claris granted temp. commission as Sub-Lieut., R.N.V.R., with seniority Feb. 2nd.

H. R. C. Whates granted temp. commission as Sub-Lieut., R.N.V.R., and appointed to the "President," additional, for R.N.A.S., with seniority March 3rd.

Royal Flying Corps (Military Wing).

London Gazette, February 27th.

The under-mentioned to be Temp. 2nd Lieuts.:-

For Duty with R.F.C.—L. Corpl. R. V. Walters, from Can. Corps Cyclist Bn.; Jan. 25th.

Flying Officers.—2nd Lieut. E. A. Lloyd, Yeo. (T.F.), and to be sec'd.; Feb. 1st. Feb. 6th: Temp. Lieut. G. Budden, R.E.; 2nd Lieut. G. C. Young, Sea. Highrs., from attd. Garr. Bn., R. Scots, and to remain sec'd.; Temp. 2nd Lieut. (on prob.) J. H. Forbes, attd. R. Fus., and to be transfd. to Gen. List; Temp. 2nd Lieut. R. H. Ayre, Gen. List; Temp. 2nd Lieut. A. Watson, Gen. List. Feb. 7th: 2nd Lieut. J. H. Muir, S.R.; 2nd Lieut. W. E. Dawson, R.F.A. (T.F.), and to be sec'd.; Temp. 2nd Lieut. J. E. S. Long, attd. R. W. Kent R., and to be transfd. to Gen. List; Temp. 2nd Lieut. G. D. Smith, Gen. List; Temp. 2nd Lieut. D. A. Neville, Gen. List. Temp. Capt. A. G. Waller, A.S.C., and to be transfd. to Gen. List; Feb. 10th.

Flying Officers (Observers).—The rank of Temp. Lieut. H. A. Chuter, R. Fus., is as now described and not as in the Gazette of Feb. 15th. Temp. Lieut. J. Thompson, Gen. List; Jan. 20th, but with seniority from Oct. 28th, 1916. Temp. 2nd Lieut. R. Gregory, Machine Gun Corps, and to be transfd. to Gen. List; Nov. 15th, 1916, but with seniority from

Dec. 19th, 1915. Temp. 2nd Lieut. L. G. Hall, attd. Northn. R., and to be transfd. to Gen. List; Feb. 5th, but with seniority from Oct. 2nd. 2nd Lieut. E. G. W. Bisset, Gord. Highrs. (T.F.), and to be sec'd.; Jan. 7th, but with seniority from Oct. 15th. Temp. 2nd Lieut. (Temp. Lieut.) C. A. F. Brown, Gen. List; Dec. 26th, but with seniority from Oct. 20th. Temp. Lieut. W. E. Gower, attd. Notts. and Derby. R., and to be transfd. to Gen. List; Jan. 7th, but with seniority from Nov. 16th. Temp. 2nd Lieut. N. S. Dougall, Linc. R., and to be transfd. to Gen. List; Jan. 19th, but with seniority from Nov. 30th. Feb. 4th, but with seniority from Dec. 2nd: Lieut. A. W. Nasmyth, Can. Gen. List; 2nd Lieut. N. C. Denison, Yorks. L.I. (T.F.), and to be sec'd.; 2nd Lieut. V. O. Lonsdale, R.A., and to be sec'd.; Temp. 2nd Lieut. (on prob.) H. G. Downing, Gen. List. Temp. 2nd Lieut. (on prob.) F. Tapping, Gen. List; Feb. 5th, but with seniority from Dec. 2nd. Temp. 2nd Lieut. (on prob.) L. C. F. Clutterbuck, Gen. List; Jan. 3rd, but with seniority from Dec. 31st.

Equipment Officers, 2nd Class.—From the 3rd Cl.: 2nd Lieut. F. G. Brown, R.F.A. (T.F.), and to be Temp. Lieut. whilst so employed; Feb. 1st. Lieut. W. J. Hewitt, S.R.; Feb. 8th.

3rd Class.—2nd Lieut. R. W. Morison, Yeo. (T.F.), and to be sec'd.; Dec. 7th. 2nd Lieut. F. A. Woolfe, S.R.; Dec. 27th. 2nd Lieut. J. H. Cotton, S.R.; Dec. 28th. 2nd Lieut. T. F. Tomlinson, Suff. R. (T.F.), and to be sec'd.; Dec. 31st. Temp. Capt. L. M. Lilley, A.S.C., and to be transfd. to Gen. List; Jan. 1st. 2nd Lieut. E. S. Crabtree, S.R.; Jan. 2nd. 2nd Lieut. J. C. Murray, S.R.; Jan. 4th. 2nd Lieut. J. H. F. Pilling, S.R.; Jan. 12th. Temp. Lieut. H. J. Gilbert, A. Ord. Dept., and to be transfd. to Gen. List; Jan. 22nd. 2nd Lieut. F. Gilbert, D. of Corn. L.I. (T.F.), and to be sec'd.; Jan. 24th. 2nd Lieut. (Temp. Lieut.) S. J. Waters, R.F.C. (T.F.), and to be sec'd.; Jan. 26th. Feb. 2nd: 2nd Lieut. W. N. Spragg, S.R.; Temp. 2nd Lieut. (on prob.) A. G. D. West, Gen. List; 2nd Lieut. E. N. L. White, S.R. Feb. 4th: Temp. 2nd Lieut. A. F. Elliott, Gen. List; Temp. 2nd Lieut. J. G. Harriott, Gen. List.

School of Instruction.

Instructor (graded as a Squadron Commander).—Capt. J. V. Steel, R.A., a Flight-Com., and to be Temp. Major whilst so employed; Jan. 11th. (Substituted for the notification in the Gazette of Jan. 30th.)

Supplementary to Regular Corps.—H. D. Williams, from Lieut., New Zealand Forces, to be Lieut.; July 15th. The notification in the Gazette of Dec. 19th of the appointment of 2nd Lieut. (on prob.) M. Thompson is cancelled. The under-mentioned 2nd Lieuts. (on prob.) are confirmed in their rank: J. H. Muir, A. H. Bates, T. J. Owen, E. C. Fowler, H. A. C. Parker. The under-mentioned to be 2nd Lieuts. (on prob.): W. Duff; Feb. 9th. W. F. Thrutchley; Feb. 11th. S. Beeby; Feb. 12th. R. Neilson; Feb. 13th.

London Gazette Supplement, March 1st.

Wing-Commanders.—From Sqdn. Coms., and to be Temp. Lieut. Cols. whilst so employed: Capt. (Temp. Major) R. Loraine, M.C., S.R.; Feb. 13th. Capt. (Temp. Major) G. I. Carmichael, D.S.O., R.A.; Feb. 18th.

Squadron Commanders.—From Flight-Coms.: Lieut. (Temp. Capt.) J. H. Herring, M.C., S.R., and to be Temp. Major whilst so employed; Jan. 1st. Major H. S. Walker, Ches. R.; Feb. 18th.

Flight-Commanders.—From Flying Officers: Temp. 2nd Lieut. (Temp. Lieut.) L. E. Eeman, Gen. List, and to be Temp. Capt. whilst so employed; Oct. 7th. Lieut. (Temp. Capt.) H. W. G. Jones, Welsh R. (T.F.); Feb. 10th. Lieut. (Temp. Capt.) M. S. Stewart, A.S.C., relinquishes his temp. rank on ceasing to be employed as a Flight-Com.; Dec. 12th.

Flying Officers.—Lieut. (Temp. Capt.) C. B. J. Lancaster, High. L.I. (T.F.), and to be sec'd.; Jan. 25th. Lieut. A. Maxwell, R. Scots, and to be sec'd.; Jan. 26th. Temp. Lieut. A. G. Fisher, A.S.C., and to be transfd. to Gen. List; Feb. 1st. Feb. 10th: Lieut. R. N. Wolton, R.F.A. (T.F.), and to be sec'd.; Temp. 2nd Lieut. R. N. Treadwell, Essex R., and to be transfd. to Gen. List; 2nd Lieut. J. L. Payton, R.F.A. (T.F.), and to be sec'd.; Temp. 2nd Lieut. R. A. George, attd. Gord. Highrs., and to be transfd. to Gen. List; 2nd

Lieut. (on prob.) J. G. Thompson, S.R. 2nd Lieut. H. E. Darrington, Middx. R. (T.F.), and to be sec'd.; Feb. 12th.

Flying Officers (Observers).—Temp. 2nd Lieut. C. G. Riley, R. Fus., and to be transfd. to Gen. List; Nov. 15th, with seniority from April 21st. 2nd Lieut. J. C. D. Wordsworth, Durh. L.I. (T.F.), and to be sec'd.; Feb. 13th, with seniority from Oct. 3rd. 2nd Lieut. A. L. Smith, Sea. Highrs. (T.F.), and to be sec'd.; Feb. 7th, with seniority from Oct. 15th. Temp. 2nd Lieut. G. W. Doolittle, R. W. Fus., and to be transfd. to Gen. List; Feb. 6th, with seniority from Oct. 15th. Feb. 10th: Temp. 2nd Lieut. E. G. C. Quilter, Gen. List, with seniority from Oct. 20th; Temp. 2nd Lieut. (on prob.) H. C. Reade, Gen. List, with seniority from Nov. 3rd. Feb. 8th: Temp. 2nd Lieut. G. O. McEntee, R. Fus., and to be transfd. to Gen. List, with seniority from Nov. 6th. 2nd Lieut. F. O'Sullivan, N. Staff. R. (T.F.), and to be sec'd., with seniority from Nov. 7th. Feb. 13th: Temp. 2nd Lieut. (on prob.) A. G. S. de Ross, Gen. List, with seniority from Nov. 24th; Temp. Lieut. C. H. Morris, R. W. Fus., and to be transfd. to Gen. List, with seniority from Dec. 2nd; Temp. 2nd Lieut. D. C. Wollen, High. L.I., and to be transfd. to Gen. List; Feb. 6th, with seniority from Dec. 4th; Temp. 2nd Lieut. J. M. Musson, British W. Indies R., and to be transfd. to Gen. List; Feb. 13th, with seniority from Dec. 7th. Feb. 13th, with seniority from Dec. 8th: Temp. Lieut. P. Smith, R.E.; Temp. 2nd Lieut. (on prob.) W. K. Crewe, Gen. List. Temp. 2nd Lieut. (on prob.) W. A. Winter, Gen. List; Feb. 13th, with seniority from Dec. 17th. Lieut. B. M. Morris, Can. Engrs.; Feb. 12th, with seniority from Jan. 1st. Temp. 2nd Lieut. (on prob.) D. H. Simmons, Gen. List; Feb. 13th, with seniority from Jan. 2nd.

Balloon Company Commander (graded as a Flight Commander).—2nd Lieut. (Temp. Lieut.) W. Brass, Yeo. (T.F.), from a Balloon Officer, and to be Temp. Capt. whilst so employed; Feb. 10th.

Equipment Officers, Third Class.—Dec. 5th: Temp. 2nd Lieut. (on prob.) J. W. Askham, Gen. List; Temp. 2nd Lieut. (on prob.) R. G. Shackel, Gen. List. Temp. 2nd Lieut. (on prob.) J. G. Plester, Gen. List; Dec. 6th. Lieut. H. A. Wilsdon, Oxf. and Bucks. L.I. (T.F.), from Machine Gun Corps; Feb. 13th.

Memoranda.—The under-mentioned Cadets to be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: O. F. Clarke; Feb. 12th. Feb. 19th: G. N. Cockerell, C. A. Christmas and G. Baker.

Supplementary to Regular Corps.—Lieut. G. O. Hayne is placed on the Ret. List on account of ill-health contracted on active service; March 2nd. The under-mentioned 2nd Lieuts. to be Lieuts.:—Jan. 1st: A. E. Thorne, P. Tremlett, C. L. H. Hicks, (Temp. Lieut.) R. T. Lattey, (Temp. Lieut.) S. Turner, N. C. Millman, W. C. Gage, (Temp. Lieut.) L. J. Stuart, A. J. Mayo (Temp. Capt.) P. Pralle, W. O. Phillips, E. Duveen, (Temp. Capt.) H. P. Boot, (Temp. Lieut.) J. D. Troup, (Temp. Lieut.) A. J. Rickie, J. Armes, E. W. Vaughan, (Temp. Capt.) G. F. Underwood.

London Gazette, March 2nd.

Flight-Commander.—Capt. G. Adams, S. Lan. R., from an Equipment Officer, 1st Cl.; Jan. 16th.

Flying Officers.—Temp. 2nd Lieut. A. A. N. Pentland, Gen. List; Jan. 20th. Temp. Capt. H. G. Hutchinson, Gen. List; Feb. 9th.

Balloon Company Commander (graded as a Squadron Commander).—Lieut. (Temp. Capt.) C. H. Stringer, Lrs., from a Coy. Com. (graded as a Flight-Com.), and to be Temp. Major whilst so employed; Dec. 5th.

Balloon Officers.—Temp. 2nd Lieut. R. Temple, Gen. List; Nov. 7th. 2nd Lieut. (on prob.) G. L. Gamlen, R.G.A., S.R.; Nov. 21st. Jan. 2nd: Lieut. A. G. A. Hodges, Northn. R. (T.F.), and to be sec'd.; Temp. 2nd Lieut. A. C. A. Scates, R. Suss. R., and to be transfd. to Gen. List.

Adjutant.—Temp. Lieut. H. G. Waterall, Gen. List, from an Equipment Officer, 3rd Cl.; Jan. 31st.

Equipment Officers, 3rd Class.—Feb. 14th: Temp. 2nd Lieut. S. Purkiss-Ginn, Essex R.; Temp. 2nd Lieut. (on prob.) L. C. Row, Gen. List; 2nd Lieut. (on prob.) P. W. Reushaw, S.R.; 2nd Lieut. (on prob.) W. A. Sievwright, S.R.; 2nd Lieut. (on prob.) H. Smith, S.R.; 2nd Lieut. (on prob.) D. Rintoul, S.R.; Qr.-Mr. and Hon. Lieut. R. W. Monro, R.A.M.C. (T.F.); 2nd Lieut. (on prob.) J. Y. Watson, S.R.; 2nd Lieut. (on prob.) J. C. F. Williams, S.R.; 2nd Lieut. (on prob.) S. L. Amor, S.R.; Temp. 2nd Lieut. J. A. Atkinson, Gen. List; Temp. 2nd Lieut. A. D. Birkhead, Gen. List; 2nd Lieut. (on prob.) D. H. Blaikie, S.R.; 2nd Lieut. (on prob.) F. E. Bayley, S.R.; Temp. 2nd Lieut. D. Barron, Gen. List; Qr.-Mr. and Hon. Lieut. D. A. Childs, R. Suss. R. (T.F.); Temp. 2nd Lieut. F. O. Burnley, W. York. R., and to be transfd. to Gen. List; 2nd Lieut. (on prob.) E. W. Brooks, S.R.; 2nd Lieut. (on prob.) R. H.

Butler, S.R.; 2nd Lieut. (on prob.) A. T. Crook, S.R.; 2nd Lieut. (on prob.) H. L. Dawson, S.R.

Central Flying School.

Instructor in Theory and Construction.—Capt. H. C. Barber, S.R., an Equipment Officer, 1st Cl., vice Capt. G. Adams, S. Lan. R.; Jan. 16th.

Schools of Military Aeronautics.

Inspector of Technical Training (graded as a Squadron Commander).—Temp. Major A. E. G. MacCallum, Gen. List, from a Chief Instr. (graded as a Park Com.); Feb. 1st.

Chief Instructor (graded as a Squadron Commander).—Lieut. (Temp. Capt.) G. S. M. Ashby, R.A., from a Flight-Com., and to be Temp. Major whilst so employed, vice Temp. Major A. E. G. MacCallum, Gen. List; Feb. 1st.

Memoranda.—Temp. Capt. H. G. Hutchinson, from R. Mar., to be Temp. Capt. on Gen. List for duty with R.F.C.; Feb. 9th. The under-mentioned to be Temp. Lieuts. on Gen. List for duty with R.F.C.: Temp. Lieut. E. L. Burrell, from R. Mar.; Dec. 28th, but with seniority from Oct. 19th. Lieut. A. R. Rattray, from R. Ind. Marine; Feb. 15th. The under-mentioned 2nd Lieuts., Ind. Army Res. of Officers, to be Temp. Lieuts., Gen. List, whilst employed with R.F.C.: Feb. 1st: W. H. Dolphin, F. O. Baxter. The under-mentioned, from R.F.C., to be 2nd Lieuts. for duty with R.F.C.:—March 3rd: Sergt.-Major D. Mitchell, Acting Sergt.-Major A. W. Turner, Acting Sergt.-Major F. Farrer. The under-mentioned Temp. 2nd Lieuts. (on prob.), Gen. List, are confirmed in their rank: H. A. Thomas, F. H. Austin, E. A. Tottle, R. M. Burnand, D. Barron, J. A. Atkinson, A. D. Birkhead, R. J. Paton, C. P. H. Gunyon, G. G. Onions, C. H. Parker, 2nd Lieut. (on prob.) S. G. Dowsett, from R.F.C. S.R., is transfd. to Gen. List, for duty with R.F.C.; Aug. 7th. The under-mentioned to be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: Cadet W. L. Dawson, from an Officer Cadet Bn.; Nov. 22nd. C. P. Vivian; Jan. 27th. Feb. 19th: Cadet W. H. Dallow, Cadet N. A. C. Runnels-Moss, Cadet F. B. Stradling.

London Gazette Supplement, March 3rd.

Squadron Commander.—Capt. A. W. Tedder, Dorset. R., from a Flight-Com., and to be Temp. Major whilst so employed; Jan. 1st.

Flight-Commanders.—From Flying Officers, and to be Temp. Capt. whilst so employed: 2nd Lieut. (Temp. Lieut.) L. W. McArthur, M.C., H.A.C. (T.F.); Jan. 30th. 2nd Lieut. C. Gordon-Davis, N. Staff. R.; Feb. 14th. Feb. 15th: 2nd Lieut. (Temp. Capt.) J. M. Robb, Northd. Fus. (T.F.), from a Flying Officer. From Flying Officers, and to be Temp. Capt. whilst so employed: Lieut. G. J. Scott, R.F.A. (T.F.); 2nd Lieut. C. J. Q. Brand, S.R.

Flying Officers.—Temp. Lieut. T. C. Chamberlin, attd. Middx. R., and to be transfd. to Gen. List; Feb. 6th. Temp. 2nd Lieut. (on prob.) E. R. Gunner, R. Scots, and to be transfd. to Gen. List; Feb. 8th. 2nd Lieut. (on prob.) W. Green, R. Highrs. (T.F.), and to be sec'd.; Feb. 10th. Feb. 11th: 2nd Lieut. (Temp. Lieut.) N. S. Beswick, W. Rid. R. (T.F.), and to be sec'd.; Temp. 2nd Lieut. V. A. Berridge, attd. Bedf. R., and to be transfd. to Gen. List; 2nd Lieut. (on prob.) H. E. Faulkner, Lond. R. (T.F.), and to be sec'd.; Feb. 12th. 2nd Lieut. (Temp. Lieut.) A. W. Smith, L'pool R. (T.F.), from a Flying Officer (Obs.), with seniority from April 29th, 1916. Temp. 2nd Lieut. A. C. H. Groom, attd. L'pool, R., and to be transfd. to Gen. List; 2nd Lieut. K. R. Furniss, Yeo. (T.F.), and to be sec'd.; Temp. 2nd Lieut. W. A. Southey, Gen. List; 2nd Lieut. (on prob.) R. N. Hall, R.F.A., S.R.; Temp. 2nd Lieut. (on prob.) J. L. Murray, Gen. List; Temp. 2nd Lieut. (on prob.) R. S. Watt, attd. Bord. R., and to be transfd. to Gen. List; 2nd Lieut. R. C. Orlebar, S.R. 2nd Lieut. (on prob.) R. G. Ottey, Leic. R., S.R., and to be sec'd.; Feb. 13th. Lieut. H. O. D. Wilkins, Bedf. R., and to be sec'd.; Feb. 14th.

Balloon Company Commanders.—Graded as a Squadn. Com.: Lieut. (Temp. Capt.) E. B. Broughton, S.R., from a Coy. Com. (graded as a Flight-Com.), and to be Temp. Major whilst so employed; Feb. 21st. Graded as a Flight-Com.: Capt. W. J. Alexander, Devon. R., from a Balloon Com. Feb. 12th.

Equipment Officers, 3rd Class.—2nd Lieut. (on prob.) W. H. Bokenham, S.R.; Dec. 20th. 2nd Lieut. A. W. Gillespie, S.R.; Dec. 27th. 2nd Lieut. (on prob.) H. F. L. Dixon, S.R.; Feb. 8th. Feb. 14th: 2nd Lieut. C. G. Sweet, S.R.; 2nd Lieut. F. A. Thomas, S.R.; Temp. 2nd Lieut. (on prob.) M. Thompson, Gen. List; Temp. 2nd Lieut. E. A. Tottle, Gen. List; 2nd Lieut. R. A. Trelease, S.R.; Temp. 2nd Lieut. H. A. Thomas, Gen. List; 2nd Lieut. (on prob.) E. C. Deeth, S.R.; 2nd Lieut. R. H. Grant, S.R.; 2nd Lieut. B. E. Harris, S.R.; 2nd Lieut. V. S. Holbrook, S.R.; 2nd Lieut. A. Miller, S.R.; Temp. 2nd Lieut. (on prob.) E. W.

Lawrence, Gen. List; Temp. 2nd Lieut. G. G. Onions, Gen. List; 2nd Lieut. (on prob.) H. N. O'Donnell, S.R.; 2nd Lieut. T. Moore, S.R.; 2nd Lieut. H. R. Mosenthal, S.R.; 2nd Lieut. (on prob.) P. P. Nicholl, S.R.; Temp. 2nd Lieut. R. J. Paton, Gen. List.

Memoranda.—The under-mentioned to be Temp. Lieuts. whilst serving with R.F.C.:—Feb. 1st: 2nd Lieuts. F. O. Cave, Rif. Brig.; F. N. Hudson, M.C., E. Kent R. F. L. J. Shirley, York. R.; C. R. Steele, York. R.; J. M. Stubbs, Hrs.; W. R. S. Wilberforce, K.R. Rif. C.; L. G. Wood, Devon. R.; Temp. 2nd Lieut. H. R. Davies, R.E., S.R. 2nd Lieuts. R. A. Grosvenor, D. Gds., S.R.; J. P. C. Mitchell, High. L.I., S.R.; H. W. L. Poole, D. of Corn. L.I., S.R.; W. H. Ruxton, R. Ir. Regt., S.R.; 2nd Lieut. (on prob.) A. R. M. Scrase-Dickins, K.R. Rif. C., S.R.; 2nd Lieut. (on prob.) L. O'G. Whitfield, Manch. R., S.R. Temp. 2nd Lieuts. P. J. Barnett, G. E. R. Lacey, J. H. Medcalf, R. G. Meech, A. D. Mackay, attd. Arg. and Suthd. Highrs., M. G. P. Phillips, K. B. Wild. 2nd Lieuts.: R. D. W. McKergow, D. Gds.; W. J. Wyatt, Devon. R.; A. L. M. Van der Byl, R.F.A., S.R.; F. A. Prescott, Bord. R., S.R.; W. J. Pierce, L'pool. R., S.R.; A. W. Phillips, M.C., R. Fus., S.R. 2nd Lieut. (on prob.) E. E. Macartney, R.G.A., S.R.; 2nd Lieut. J. Grieve, S. Lan. R., S.R.; Temp. 2nd Lieuts. J. Senior, W. York. R.; E. H. N. Stroud, attd. Leic. R.; C. B. Dolphin, A.S.C.; B. W. Hill; C. G. Ronaldson-Clark; C. W. D. Holmes, attd. Bedf. R.; G. L. Graham, attd. Hrs. M. Thompson to be Temp. 2nd Lieut. (on prob.) for duty with R.F.C.; Dec. 11th.

Supplementary to Regular Corps.—The under-mentioned 2nd Lieuts. (on prob.) are confirmed in their rank: R. A. Trelease, F. A. Thomas, C. G. Sweet, J. Y. Watson, J. C. F. Williams, W. H. Bokenham, A. W. Gillespie, S. L. Amor, H. Smith, T. Moore, A. T. Crook, E. W. Brooks, H. L. Dawson, R. H. Butler, H. R. Mosenthal, W. A. Sievwright, F. E. Bayley, D. Rintoul, B. E. Harris, V. S. Holbrook, R. H. Grant, A. Miller, R. C. Orlebar. The under-mentioned to be 2nd Lieuts. (on prob.): E. C. Deeth; Dec. 8th. J. S. V. Stephen; Feb. 13th. A. C. Truelove; Feb. 15th. Feb. 16th: C. J. Couchman, C. Guthrie.

Flight Commanders.—From Flying Officers and to be Temp. Capt. whilst so employed: 2nd Lieut. V. J. Whitaker, Linc. R., S.R., Feb. 14th; Lieut. R. H. M. S. Saundby, R. War. R.

(T.F.), Feb. 20th; Temp. Lieut. H. Fowler, Gen. List., Feb. 22nd.

Flying Officer.—Temp. Lieut. F. L. Atkinson, Gen. List., Feb. 13th.

Balloon Commanders (graded as Balloon Officers).—From Balloon Officers, Jan. 29th, Capt. W. J. Alexander, Devon R.; Lieut. P. G. Bateman, Lond. R. (T.F.); Temp. Lieut. O. H. Weekes, A.S.C.; 2nd Lieut. (Temp. Lieut.) A. M. Van der Byl, H.A.C. (T.F.), and to be secd.; Temp. 2nd Lieut. (Temp. Lieut.) W. A. Dunn, Gen. List. From Balloon Officers, and to be Temp. Lieuts. whilst so employed, Jan. 29th: Temp. 2nd Lieut. T. N. Jennings, Gen. List.; 2nd Lieut. E. G. N. Grimble, Herts. R. (T.F.), and to be secd.; 2nd Lieut. F. G. Lake, Herts. R. (T.F.), and to be secd.; 2nd Lieut. T. G. G. Bolitho, S.R.; 2nd Lieut. P. S. Kershaw, S.R.; 2nd Lieut. H. F. Wright, S.R.; Temp. 2nd Lieut. N. McN. Beaton, Gen. List.; Temp. 2nd Lieut. H. E. Goody, Gen. List.; 2nd Lieut. F. C. Mears, S.R.

Equipment Officers, 2nd Class.—From the 3rd Cl., and to be Temp. Lieuts. whilst so employed; 2nd Lieut. C. F. Blunt, S.R., Feb. 13th; Qr.-Mr. and Hon. Major J. Liddle (T.F. Res.), Feb. 25th.

Memoranda.—Sub-Lieut. F. L. Atkinson, from R.N.V.R., to be Temp. Lieut. for duty with R.F.C., Feb. 13th; C. J. Hallward to be Temp. 2nd Lieut. (on prob.) for duty with R.F.C., Feb. 21st.

Supplementary to Regular Corps.—2nd Lieut. (on prob.) L. Sloden resigns his commission; March 6th. 2nd Lieut. W. O. Crowe is placed on the ret. list on account of ill-health contracted on active service; Mar. 6th.

Royal Flying Corps (Territorial Force).

London Gazette Supplement, March 1st.

Lieut. (Temp. Capt.) H. Grinstead to be Temp. Major; Jan. 1st. 2nd Lieut. (Temp. Lieut.) H. D. Teage to be Temp. Capt.; Jan. 1st.

London Gazette, March 2nd.

2nd Lieut. (Temp. Lieut.) A. H. Lister to be Temp. Capt.; Jan. 1st.

Aeronautical Inspection Department.

London Gazette, March 2nd.

H. R. Knight to be Temp. Hon. Lieut. (without Army pay or allowances), whilst employed as an Assist. Inspector A.I.D.; March 3rd.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

British.

Admiralty, February 28th.

"On the 25th inst. a raid was carried out by a number of naval aeroplanes on the ironworks at Brebach (5½ miles E.S.E. of Saarbrücken). Several air encounters took place. One hostile machine was destroyed."

General Headquarters, February 28th.

"Much valuable reconnaissance work was carried out by our aeroplanes yesterday, and a number of air fights took place. Three of our machines were brought down."

General Headquarters, March 3rd.

"Successful trench reconnaissances were carried out by our aeroplanes to-day. One of our machines is missing."

General Headquarters, March 5th.

"Yesterday there was considerable activity in the air, and many combats took place. In the course of the day six hostile aeroplanes were brought down, two falling within our lines, and eight were driven down damaged. Two of our machines were brought down and five are missing."

"Useful artillery and reconnaissance work was carried out. Many places of military importance were attacked with bombs."

French.

Paris, March 2nd.

"During the evening of March 1st two enemy aeroplanes dropped bombs on Montdidier. One woman was killed and two children and a man were injured. One of our squadrons, composed of 11 machines, bombarded the barracks at Guiscard, the station of Appilly, and that of Babœuf (Oise), where a fire was observed."

"During the night an enemy aeroplane dropped some bombs on the outskirts of Compiègne. Only slight material damage was done."

Paris, March 4th.

"On Saturday night our bombarding squadrons dropped bombs on the hangars of Frescati, the powder factory of Bons-les-Hauts, and on the blast furnaces of Woelfling (district of Saarbrücken), and on the railway station of Delme."

Paris, March 5th.

"During the day two German aeroplanes attacked by our pilots were brought down, one in the region of Autrecourt (Meuse), the other near Nampcel (Oise). A third machine was brought down to the north of Burnhaupt by the fire of our special guns."

Russian.

Petrograd, February 27th.

"Our airman, Ensign Effimoff, engaged three times a German machine which appeared over the town of Dwinsk and made it come down in its own lines."

Petrograd, March 4th.

"In the region of Dwinsk one of our aeroplanes during a fight with an enemy machine fell in flames. The pilot, Flight-Lieut. Galkine, and the observer, 2nd Capt. Baron Drachenfels, were killed."

"One of our pilots engaged two German aeroplanes, one in the region of Smorgon and the other in the region of Boruny, south-east of Smorgon. In both cases the German aviators were driven back to their own lines. South of Liakhovitchi, south-east of Baranowitschi, one of our aeroplanes, after a fight with an enemy machine, was forced to descend, the French observer, Sub-Lieut. Bornais, being killed, and the pilot, Adjutant Gretchkin, being wounded in the head."

Petrograd, March 5th.

"South-west of Luzk our artillery brought down an enemy machine, which, on descending, caught fire. The aviators were taken prisoners."

Italian.

Rome, February 26th.

"Our anti-aircraft batteries hit an enemy aeroplane that fell down near Duino [on the coast south-east of Monfalcone]. Last night two of our airships successfully bombarded the railway station of Rifemberg, in the Branizza Valley (Friedito), and the aviation ground at Processo, north of Trieste. On the objective 2½ tons of high explosives were dropped with effective result. In spite of heavy fire from hostile anti-aircraft batteries and of a violent unfavourable wind, the airships returned safely to their bases."

HONOURS.

Honours for the R.F.C.

It was announced in the *London Gazette* of March 3rd, that the King had been graciously pleased to approve of the appointments of the following Officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the field:—

2nd Lt. (Temp. Capt.) GEORGE CYRIL BAILEY, R.F.C.
(Spec. Res.).

He co-operated in an infantry raid by flying over the enemy's trenches at a height of only 1,500 feet for more than an hour and a half in very adverse weather conditions. He attacked the enemy in the trenches with machine gun fire, and located sixteen active enemy batteries during the flight. He has repeatedly done very fine work.

Lt. (Temp. Capt.) JUSTIN HOWARD HERRING, M.C., R.F.C.
(Spec. Res.).

He displayed great courage and initiative in bombing an enemy gunboat which was towing a bridge upstream. He flew continuously for six hours under heavy rifle fire, and seriously harassed the enemy by preventing his bridging operations. On another occasion he carried out a successful raid and brought back most valuable information.

Bt. Lt.-Col. (Temp. Brig.-Gen.) WILLIAM GEOFFREY
HANSON SALMOND, R.A. and R.F.C.

For conspicuous ability and devotion to duty when personally directing the work of the Royal Flying Corps during the action. The striking success attained was largely due to his magnificent personal example.

The King has been pleased to award a bar to the Military Cross to the following Officers:—

Lt. (Temp. Capt.) WALTER DALRYMPLE MAITLAND BELL,
M.C., R.F.C. (Spec. Res.).

He has on several occasions displayed great courage and determination in aerial combats with enemy machines. (Military Cross awarded in *Gazette* dated June 26th, 1916.)

The King has been pleased to confer the Military Cross on the following Officers and Warrant Officers, in recognition of their gallantry and devotion to duty in the Field:—

Temp 2nd Lt. ALFRED VICTOR BLENKIRON, Som. L.I.
and R.F.C.

Although wounded, he fired his machine with great skill and brought down an enemy machine, thereby enabling his pilot to bring his machine safely home. On another occasion he displayed great courage when observing on patrol, and brought down a hostile machine.

Temp. 2nd Lt. ALLAN DENISON, Gen. List and R.F.C.

Although wounded, he continued single-handed to fight two enemy machines, and succeeded in bringing one of them down. Later, although his machine was badly damaged, he effected a successful landing. He has at all times displayed marked courage and initiative.

Temp. Lt. WILLIAM EDWARD GOWER, Notts and Derby R.
and R.F.C.

When his machine was set on fire, he stood up in his seat and sprayed his pilot with a fire extinguisher, thereby enabling his pilot to regain control of the machine and to make a successful landing.

Temp. Capt. WILLIAM JAMES YULE GUILFOYLE, R.F.C.

He carried out a daring bombing raid and made a valuable reconnaissance under heavy fire during the same flight. He has at all times set a fine example.

Temp. 2nd Lt. (Temp. Lt.) SHIRLEY GEORGE KINGSLEY,
Gen. List and R.F.C.

He was attacked by three hostile machines and shot down. To ensure that his machine would be destroyed, he deliberately landed in the sea at great risk to himself, as he had been wounded, and only with difficulty swam ashore.

Lt. GERALD MERTON, R.F.C., Spec. Res.

Whilst on reconnaissance he attacked and drove down a hostile machine. Later, although his machine was badly damaged, he succeeded in regaining our lines.

Temp. 2nd Lt. (Temp. Lt.) STANLEY KEITH MUIR, Gen. List
and R.F.C.

He carried out a daring bombing raid, and was largely instrumental in shooting down a hostile machine. On another occasion he pursued two enemy machines, and succeeded in bringing one of them down.

2nd Lt. (temp. Lt.) ELMER PETER ROBERTS, R. Suss. R.
and R.F.C.

He three times dispersed an enemy working party with bombs and machine gun fire from a height of 1,000 feet. On another occasion he shot down an enemy machine. He has shown great determination on many occasions in taking photographs under most difficult conditions.

Lt. WALTER SOMERVILLE SCOTT, Lan. Fus. and R.F.C.

On several occasions he displayed great skill and daring in carrying out his orders under dangerous conditions.

Temp. 2nd Lt. LEWIS SCOTT WHITE, Gen. List and R.F.C.

When acting as observer he cooperated in an infantry raid by flying over the enemy's trenches at a height of only 1,500 feet for more than an hour and a half in very adverse weather conditions. He attacked the enemy in the trenches with machine-gun fire, and located 16 active enemy batteries during this flight.

Roumanian Honour for R.N.A.S.

It was announced in a supplement to the *London Gazette* on March 1st, that the following decoration had been conferred by the King of Roumania for distinguished services rendered during the war:—

ORDER OF MIHAI VITEAZUL (THIRD CLASS).

Flight Lieut. ARTHUR F. F. JACOB, R.N.A.S.



DURALUMIN AND ANNEALING.

IN many cases, on a modern aeroplane, there are parts and fittings which may be subject to only comparatively small stresses and for which, therefore, some metal other than steel can be used to advantage, thereby often effecting a very considerable saving in weight. Of these metals aluminium alloys are, perhaps, those most frequently employed, and of these again Duralumin is probably one of the best known. In changing over from steel to Duralumin for certain purposes it is, of course, necessary that the characteristics of the Duralumin be known and allowed for, not only from the point of view of strength for the work it has to do, but also as regards the ways and means of handling the material during the process of manufacturing the article from the sheet, bar, tube, or whatever form the metal had originally. Judging from the number of enquiries we have received, some difficulty appears to have been experienced in bending this metal, and as, so far as we are able to judge, these difficulties lie in not knowing always the right treatment for the purpose in question rather than in any shortcoming in the metal itself, a few words regarding the proper heat treatment of Duralumin may be of help to readers generally as well as to those who have written us upon this subject.

The method of annealing Duralumin recommended by the makers—Messrs. Vickers, Ltd.—consists in heating the metal in a muffled furnace or salt bath to a temperature of approximately 350° C., but not exceeding 420° C. When the required

temperature has been reached, the metal can either be allowed to cool slowly, or it may be quenched in water, according to the purpose for which it is required. Since Duralumin has shown, especially if the temperature of annealing has been above 350°, a tendency to harden up in the course of time, it is important that mechanical work on the article should be done as soon as possible after annealing, but for most classes of work it should not be a matter of any great difficulty to so plan the work that only as much of the metal is annealed at a time as can be used up during the day it is annealed. When due care is exercised in the annealing process, no difficulty should be experienced in bending fittings made from Duralumin, although it must not be expected that it can be bent over so short radii as are possible with, for instance, mild steel or soft brass. If this has to be done, it should be done in two or more operations if the fitting is of a fairly heavy gauge.

Not infrequently a suitable pyrometer for obtaining the necessary temperature of annealing is not available, and although greater precision is naturally obtainable by its use, a pyrometer is not an absolute necessity, the following rough and ready method of ascertaining the correct temperature being recommended. The metal is slowly heated and is tested at intervals by placing a piece of ordinary newspaper on it. When the heat is such that the metal will just lightly brown a piece of the newspaper, placed on it, the right temperature has been approximately reached.

SIDE-WINDS.

It is now some four months since the Highgate Aircraft Co., Ltd., of which M. Tony Antoine is managing-director, opened their works in Pauntley Street, Highgate, and a recent visit revealed the fact that a great deal is already being done. In addition to contracts for the Government, this firm are building various aeroplane parts for private constructors, and at the same time machines of highly original design, radically different from what one has come to regard as standard practice. In Mr. Hellers the firm have a very capable works manager, who is responsible for the production of machines, and within the few months the firm has been going he has established the output on a very creditable basis.

THE recent squeezing out of civilian flying schools from the Hendon Aerodrome, although not being the cause of the removal to a new large ground at Acton, has been instrumental in accelerating the preparations now being made there by the Ruffy, Arnell and Baumann Aviation Co., Ltd. This "squeezing out" was, it may be here set down, of quite a friendly nature, the various schools being, we understand, given every assistance in finding new grounds on which to continue the good work they have been doing. The company's new ground at Acton, which had been acquired before the notice to vacate the sheds at Hendon was received, is favourably situated having at its boundaries three railways, whilst several other lines pass within a very short distance of the ground, so that altogether there are something like five railway stations within about five minutes' walk of the site on which the new buildings will be erected. When we visited the new ground last week gangs of workmen were hard at it clearing away hedges and felling trees, and very now and then reports could be heard from various parts of the grounds which suggested that some of the stumps of the venerable old oaks were having their roots rudely rent by means of dynamite.

As already mentioned, the new ground is of triangular plan, and is remarkably level—level, that is to say, in so far as it is not of an undulating nature. It has, however, a gentle slope throughout its whole area, with the result that it is excellently drained and is quite dry—even at this time of the year. Already most of the hedges which were in the way have been removed, and others will disappear in the near future. A great advantage for school purposes is that, owing to the shape of the ground, it will be possible, no matter what the direction of the wind, to run two parallel "straights," thereby at once doubling the number of machines it is possible to have at work simultaneously. Until the new factory and hangars can be erected the school machines are being housed in a number of tents, so that the school work may be carried on without interruption.

As regards the new works and sheds, it is intended to put up a building large enough to house these under one roof. A permanent brick building with a four-span roof has been planned, at one end of which will be the boiler-house and doping shops, while above these will be the various offices, overlooking the works. The latter will include both wood-working and metal-working shops, the rest of the building being set aside for erecting shops and for housing the school machines. We understand that it is intended to have quite

a number of machines in commission—how many, we are naturally debarred from stating at the present moment. Unless unexpected difficulties in regard to labour crop up, the firm have hopes of putting up their new factory and sheds in record time, and hope to be working full swing in a comparatively short period.

THE many friends of Mr. A. Coker, of Messrs. Thos. Parsons and Sons, the world-known varnish and colour firm, will wish him good luck in his new sphere. He joins up with the senior service at Chatham at the end of the week. "Oh! for a life on the ocean wave!"

CONGRATULATIONS and best wishes to Mr. J. Kemp Walton, married on Wednesday, March 7th, at Crofton Park, Brockley. Mr. Walton is the popular secretary of the Grahame-White Aviation Co., at Hendon, and will, we feel sure, carry into the new partnership the heartiest good wishes of all who have come into contact with him during his connection with the aerodrome.

SIMPLEX sounds to a casual reader not very far removed from Triplex. And they would be right in their judgment, as Triplex Safety Glass is a problem so simple, to eliminate accidents arising from broken glass. Is it very surprising therefore that a simple compositor, in setting up the Triplex Glass advertisement the other week, managed to get it as Simplex? But just the same, Triplex Safety Glass Co., Ltd., prefer to adhere to their original conception of their unique goods now they have associated it with such a world-wide reputation. Readers please note therefore it is Triplex, and not Simplex as printed on March 1st.

It was announced on March 3rd, that an order had been made by the Board of Trade, under the Trading with the Enemy Amendment Act, 1916, requiring the business of the Mea Magneto Co., Ltd., Gresse Buildings, 3, Stephen Street, London, W., dealers in magnetos, parts and accessories, to be wound up.

WITH the great variations in altitude, and consequently in temperatures, traversed by the modern aeroplane, the question of a controllable cooling system becomes one of no small importance, since obviously the rate at which a given radiator will transfer the heat from the cooling water to the surrounding air will be different at, for instance, 15,000 feet, from that obtaining at ground level. It is the realisation of this important fact that led the Gallay Radiator Co., Scrubb's Lane, Willesden Junction, N.W., to set to work and produce a new type of aero radiator, designed and patented by Mr. L. Delaney. This incorporates, among other interesting features, provisions for adjusting the amount of cooling surface to the speed of the aeroplane and temperature at the altitude at which it happens to be flying. A further interesting point with regard to this latest Gallay radiator is that on a long glide from a great height the cooling surface may be reduced to a minimum, thus obviating the danger, otherwise present, of the engine getting so cold that it refuses to restart at the end of the glide. The way in which all this is carried out in the Gallay is extremely simple, and the new system is well worthy of the consideration of manufacturers who are using water-cooled engines.

CLIFFORD B. PRODGER—TEST PILOT.

By D. W. THORBURN.



Mr. Clifford B. Prodger.

ONE of the most striking performances in aviation in 1916 was the world's record flight of a British aeroplane, which carried a pilot and no fewer than 20 passengers to a height of 7,000 ft. At the time it was inadvisable to publish details of the event, as they would have been of special interest to the enemy, but it is now permissible to state that the machine was a twin-engined Handley Page biplane, and the pilot was Mr. Clifford B. Prodger.

It was a performance of which both Mr. Handley Page and his pilot may well be proud, and the altitude reached would undoubtedly have been much greater but for the un-

favourable atmospheric conditions prevailing. The ascent was made from Hendon, and all went well until, at something over 6,000 ft., a dense layer of clouds was encountered and we lost our way. I say "we" because I happened to be one of the crowd—the internal crowd, that is, not the lesser crowd on the ground. The last landmark we had noticed before the earth disappeared from view was Chingford Aerodrome. All sense of direction, it is scarcely necessary to mention, soon ceases in the midst of a thick cloud. Mr. Prodger had a horrid vision of a forced landing in some distant field—perhaps 30 or 40 miles from London—followed by a long walk back (it was doubtful if we could have collected sufficient for our railway fares between us), with himself at the head of the weary procession, and decided to switch off and come down. The first place we recognised on emerging from the clouds was Richmond Hill, so it is interesting to speculate where we might have got to if we had kept on!

Anyway, he brought us back to Hendon and made a perfect landing, and when we had all disembarked and the roll was called not a man was missing.

I always thought that Walter L. Brock, the unceasing masticator and the winner of many notable aerial races, was the most modest American England had ever seen, until C. B. Prodder came over. The latter is so modest that very few of his friends have any idea of how varied a career he has had, and a brief outline of his history may be of some interest.

Clifford B. Prodder was born at Alexandria, Minnesota, U.S.A., in 1890. As far as I can gather he went through the usual kind of American childhood—was told he might one day be President, attended school and stayed away, and had prizes and measles and all the rest of it. He then developed a taste for "punching cows," and for seven years was ranching in the Little Missouri Valley, which is, incidentally, the region in which Roosevelt acquired his reputation as a roughrider. Why anyone should ever want to punch cows I do not know. I never had any special desire that way myself, and there would always be the uncertainty as to what retort the cow might feel called upon to make; but evidently the life suited Prodder, even if it didn't suit the cows, and it is probably at this stage in his career that he got the taste for fresh air which later on attracted him towards aviation.

After seven years' ranching he decided to have a change, and accepted an appointment on the Northern Pacific Railway. No doubt our Dreamer could philosophise a column or two from the depths of his noted armchair on the subtle connection between punching cows and punching tickets, though I hasten to add I do not know if the latter was included among Prodder's duties. His new occupation, however, gave him an excellent chance to see a good deal of his native country, and also gave him a taste for speed, for he next went into the motor business and became well known as an amateur racer. He won many prizes, including the Montana Speed Trophy in 1910.

It was in the latter part of 1911 that he turned his attention to aviation. After some most useful experience in aeroplane construction at Louisville, Kentucky, he came to Nassau Aerodrome, Long Island—which might be described as the Hendon of New York—to learn to fly. While he was training there the school was moved to Hampstead Fields, and after eight lessons of 15 minutes each Prodder secured his ticket on a Wright biplane, his instructor being Mr. G. W. Beatty. Later on he went back to Louisville, where he gave exhibition flights on a Curtiss "pusher," and took part in the Chicago meeting in September, 1912, returning the following month to New York to join Beatty as instructor. He did a good deal of special work for the Pathé Film Co., never once being mistaken for Charlie Chaplin, and also went in for night flying. In the spring of 1913 he went to Montana to give exhibitions on his own machine—a monoplane with an 8-cylinder V-type Boland motor.

After this it seemed, as Prodder expresses it, that there was "nothing doing" in aviation in the U.S.A., and he gave up flying for a time. The change of conditions, however, brought about by the European War induced him to resume his activities, and in February, 1915, he came over to Hendon and rejoined Beatty as an instructor. He did some excellent work, and in the following September became associated with Mr. Sydney Pickles in testing machines for active service. Since Mr. Pickles retired he has "carried on," with Mr. Bernard Isaac as business manager. He has put some hundreds of machines through their official tests, and made countless cross-country flights. He has flown practically all types, both land and sea. His report on a machine is accepted without question, because he thoroughly understands his work. What is more, he enjoys it. He never stunts merely for the sake of stunting, but only when some special object is to be attained, and then he will "throw a loop" as neatly as he once threw a lasso, or stall a 'bus as easily as he formerly stalled an ox.

There is no better all-round aviator in the country than Clifford B. Prodder, and his services are in constant demand. He has had exceptionally wide experience, and his many adventures—of which his record flight with 20 passengers is only one episode—would make a volume of surpassing interest if he could be persuaded to write one. At present he is almost too busy to eat even the restricted meals of 1917. He has been very successful, and he has deserved it.

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Heat Treatment.

SIR WILLIAM BEARDMORE, Bart., is to read a paper on "Heat Treatment of Large Forgings," and Mr. H. H. Ashdown one on "Heat Treatment of Steel Forgings," before the Institute of Mechanical Engineers, on Friday, March 16th, at 6 p.m. The meeting will be held at the Institution of Civil Engineers, Great George Street, Westminster, S.W.

Fatal Accidents.

At an inquest on March 1st on Lieut. Charles Michael Needes, R.F.C., and Sergt. Henry Liddle, R.F.C., who were killed on February 27th, the evidence showed that pieces were seen to fly from the machine, which crashed to earth enveloped in smoke, and alighted bottom upwards, both occupants being dead when extricated. A verdict of "Accidental Death" was returned.

Two fatal accidents occurred in Wiltshire on March 1st. 2nd Lieut. H. T. White was flying at a height of about 800 ft. when he was seen to make a spiral descent to about 400 ft. After going straight for a short distance he turned sharply to the left, and the machine made a spinning nose-dive to earth. The pilot was killed instantaneously. 2nd Lieut. A. D'A. Sutherland, R.F.C. (S.R.), left his aerodrome at about 8 o'clock in the morning, and rose to a height of 1,000 ft. He was seen to dive towards another machine which was considerably below him. When he had nearly reached the same level he tried to straighten his machine too quickly, with the result that the right wing crumpled up. The left wing subsequently gave way and the machine nose-dived to earth.

At the inquest on the body of Lieut. F. A. Perraton, R.F.C., who met with a fatal accident when piloting a biplane on March 1st, it was stated that he might possibly have fainted and fallen forward on the controls, which would cause the machine to make a nose-dive. A verdict of "Accidental Death" was returned.

A verdict of "Death through Immersion in the Sea" was returned at an inquest held at Dover on February 28th on the body of Sergt. W. P. Thompson, an observer, picked up in the Channel. He, with an aviator named Lincoln, was flying to France, but after leaving the coast they apparently came down, and were lost. Lincoln has not yet been found.

□ □ □ □

COMPANY MATTERS.

Auster (1914), Ltd.

THE accounts of Auster (1914), Ltd., for the year ended December 31st last show a net profit of £6,884, and £2,043 was brought forward, making £8,928. The directors propose a dividend of 7½ per cent. on the ordinary shares for year ended December 31st last, less tax, and to carry forward £4,917.

NEW COMPANY REGISTERED.

AEROPLANE AND MOTOR BODIES, 9, Ravenscourt Avenue, Golders Green, N.W.—Capital £3,500, in £1 shares. Under agreement with A. Ravelli and Luc M. Dartois. First directors: Luc M. Dartois, O. M. Gilliaux, S. Michotte and A. Ravelli.

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PUBLICATION RECEIVED.

Machine Guns and Their Uses, By "Simplex." London: Forster Groom and Co., Ltd. Price 1s. net.

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Index and Title Page for Vol. VIII.

The 8-page Index for Vol. VIII of "Flight" (January to December, 1916) is now ready, and can be obtained from the Publishers, 44, St. Martin's Lane, W.C., Price 6d. per copy, post free.

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week.

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